PUBLIC HEALTH REPORTS

In this issue

FEDERAL SECURITY AGENCY • Public Health Service

The Crossett Health Center serves the 5,000 persons in the lumber town of Crossett, Ark., as well as thousands of others living in the rural countryside within a 50-mile radius. It was one of the first hospitals built under the program of the Hospital Survey and Construction Act to include an out-patient department. A separate wing, shown above, houses this department, which has its own entrance, waiting room, information office, 2 examination rooms, 5 consultation rooms, 2 treatment rooms, a minor surgery room, a physical therapy room, and a dental suite containing 3 operating rooms. The 56-bed air-conditioned hospital was built from the plans of William Lescaze of New York City.

Volume 67 Number 8 **August 1952**

PUBLIC HEALTH REPORTS

Published since 1878

Contents

	Page
Manpower shortages in official health agencies *William P. Shepard.*	709
Statistics in public health programs and administration:	
Vistas in public health statistics *Clarence J. Velz.*	725
Application of statistical analysis in a health program *Ruth R. Puffer.*	729
Current methods of collecting statistics of health and health problems *O. K. Sagen.*	737
Statistics in the administration of a State health department *John D. Porterfield.*	741
The administrative value of statistics to a local health officer *Berwyn F. Mattison.*	747
The medical entomologist in public health *E. Harold Hinman.*	755
The tuberculosis problem *Russell E. Teague.*	759
Group chest X-ray examinations and the tuberculosis death rate *Philip Enterline.*	762
Prevalence of tuberculosis in the United States	766
Public health and medicine at the crossroads *Herman E. Hilleboe.*	767
Ideas	772
Age aspects of environmental and occupational cancers *W. C. Hueper.*	773
Voluntary reporting of venereal diseases in contacts previously reported not infected *Benson H. Sklar, Leonard M. Schuman, and Norman J. Rose.*	780
Dietary standards in the United States *L. A. Maynard.*	784

Continued ▶

PUBLIC HEALTH MONOGRAPHS

are edited and issued by *Public Health Reports* under the general direction of the Board of Editors. The monographs present contributions to knowledge in the fields of public health, particularly material that is extensive, detailed, or specialized. All manuscripts considered for publication as monographs receive the same technical and scientific review as papers submitted to *Public Health Reports.*

Public Health Monographs are listed in the table of contents of the issue of *Public Health Reports* with which they are concurrently published. They are also listed in its annual index, and in the *Quarterly Cumulative Index Medicus* (American Medical Association) and the annual *Armed Forces Medical Library Catalog.*

The monographs replace in whole or in part a number of publications series previously issued by the Public Health Service, including Public Health Bulletins, Bulletins of the National Institutes of Health, Venereal Disease Bulletins, and Supplements to the *Journal of Venereal Disease Information* and to the former weekly *Public Health Reports.*

Each Public Health Monograph is placed on sale by the Superintendent of Documents; series subscriptions are not available, nor are monographs included in subscriptions to *Public Health Reports.*

Contents for August—continued

PHS films 787

Family food consumption studies 788
C. M. Coons.

Drug experience in two programs for medical care 797
Herbert Notkin, Bettie Rogerson, Wilfrid Davis, and Matthew Taback.

Refuse-can holders 802
Ralph J. Van Derwerker and Charles C. Johnson, Jr.

Two surveys of disabling illness 807
Theodore D. Woolsey.

Leptospiral etiology of Fort Bragg fever 811
William S. Gochenour, Jr., Joseph E. Smadel, Elizabeth B. Jackson, LaRue B. Evans, and Robert H. Yager.

PHS publications 814

Public health in the scientific assembly of the American Medical Association. PHR conference report 815

Short reports and announcements:

Environmental health course . . . 724. Vocational rehabilitation . . . 746. Nursing study . . . 758. Heart disease facility . . . 761. Dr. Knutson appointment . . . 779. Heart radio series . . . 796. Birth weight data . . . 828.

Published concurrently with this issue of Public Health Reports . . .

PUBLIC HEALTH MONOGRAPH NO. 4

Estimates of disabling illness prevalence in the United States
by Theodore D. Woolsey

Sixteen pages + iv, illustrated. A summary article and information about availability appear on pages 807 to 810 of this issue of Public Health Reports.

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Manpower Shortages in Official Health Agencies

By WILLIAM P. SHEPARD, M.D.

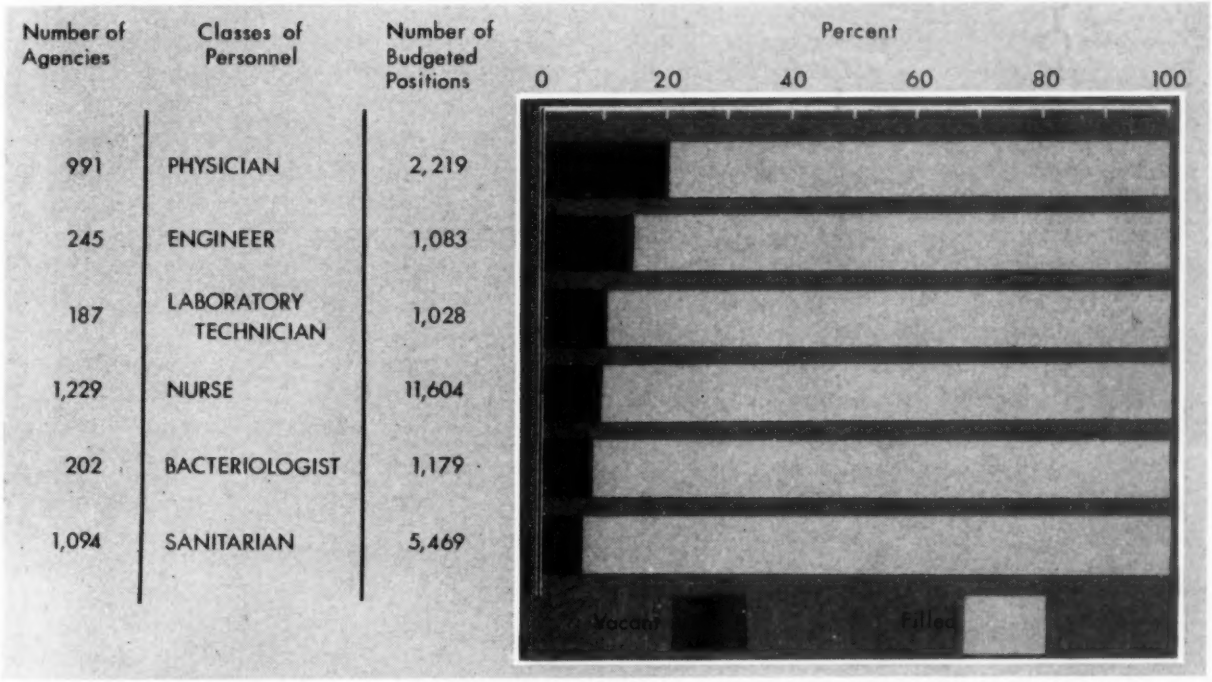

Figure 1. Percentage of vacancies in budgeted positions for selected categories of professional and technical personnel in which 1,000 or more budgeted positions were reported in State and local health departments.

The acute shortage of professional and technical personnel is today the most serious problem in the field of public health. Trained workers, never available in numbers adequate to meet the needs of organized health agencies, are in steadily increasing demand from a number of sources. There are growing populations to be served by public health agencies, newly developed services to be provided, and new and urgent problems in connection with national defense activities. Nor are the demands limited to personnel in public health. Physicians, nurses, dentists, and other professional workers are being called on to supply needed manpower in civilian activities related to defense. Thus, while the resources of trained health personnel are being depleted, demands for the services they are qualified to provide are constantly increasing.

The Health Resources Advisory Committee

of the Office of Defense Mobilization was appointed, as its name implies, to deal with the various aspects of health resources during a period of mobilization. Of serious concern to the committee is the problem of health manpower. The Public Health Service was called upon to study the staffing of State and local health departments and the utilization of personnel employed in these agencies. Reports on professional and technical personnel employed in official health agencies, as well as inventories of vacant positions and of staff members subject to military service, were requested. Information was submitted by State and local health departments in the continental United States, Alaska, the Hawaiian Islands, Puerto Rico, and the Virgin Islands. In this report, attention is limited to participating health agencies in the continental United States.

The high lights of the 1951 survey findings with respect to manpower needs and resources in the participating State and local health departments are presented in this report, which will be followed by a publication being prepared by the Public Health Service in which the information made available through the survey will be presented in detail.

Traditionally, basic minimum services provided by public health agencies have been built around the teamwork of physician, nurse, and sanitation worker. In the early days, their problems concerned the prevention and control of epidemics, the curbing of infectious diseases, and the provision of healthful physical environment. Present-day health departments, in addition to safeguarding the gains made in meeting earlier problems, face complex demands in many new fields. Chronic illness, the health problems of an aging population such as heart disease, cancer, and diabetes, social and economic factors in modern living, mental health, and new standards of acceptable environment are among the areas which must be taken into account in modern health department operation.

To gain a broad view of health department planning for both the new and the old concepts of service, information was sought concerning personnel in a number of occupational classes. Positions budgeted for laboratory personnel, public health investigators and health educators, medical and psychiatric social workers, among others, provided information on the direction in which programs are developing. For the professional and technical groups that make up the health department framework—physicians, nurses, engineers, and sanitarians—additional information as to age, sex, position, and status with respect to military service was requested. Because public health dentists and veterinarians are also subject to military call, they were included in the basic group.

Budgeted and Vacant Positions Reported

Reports of budgeted but vacant positions represent a gross understatement of total requirements, since, in general, the number of positions budgeted is not related to requirements. Available funds for personnel, rather than need, usually govern the total number of positions budgeted. Actually, budgeted positions as reported fail in many instances to indicate the total unfilled positions. Frequently, positions which remain vacant from one budgeting period to another are abolished when there is convincing evidence that candidates for appointment are not likely to be found. The study is informative, however, in that differences in the percentages of vacant budgeted positions for professional groups give some indication of where the greatest shortages exist. Such vacant positions reflect an immediate need recognized by health authorities as well as by appropriating bodies. Vacancies for physicians (20 percent of all positions budgeted for medical personnel), sanitary engineers (14 percent of that group), and dentists (21 percent) were greater than the proportion of positions vacant for sanitarians (6 percent) or veterinarians (10 percent). Although only 9 percent of the nursing positions were vacant, the total number of vacancies exceeded that of any other professional group. These six groups

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Dr. Shepard, past president of the American Public Health Association, is a member of the Health Resources Advisory Committee, Office of Defense Mobilization. His report is based on a study conducted in 1951 by the Public Health Service for that committee.

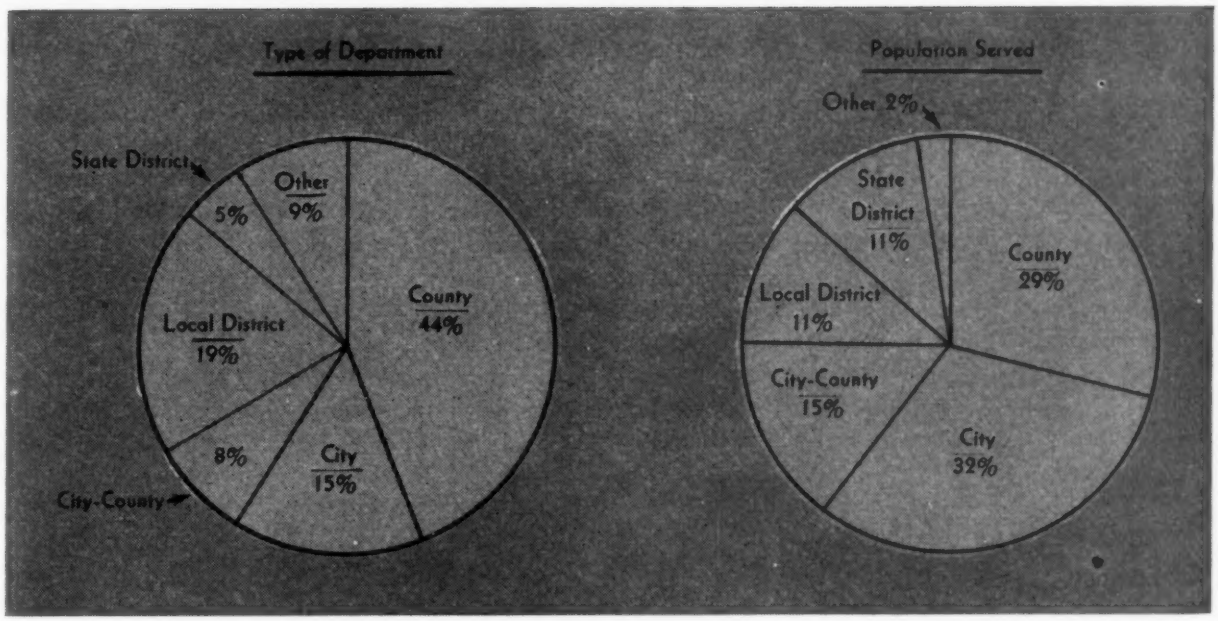

Figure 2. Percentage distribution of all local health agencies according to type of department and population served.

make up a considerable part of the staff for basic health department operations. Consequently, vacancies represent serious limitations on the effectiveness of health department programs and services. Some idea of the seriousness of the situation is revealed by figure 1, showing the percentage of vacant positions for certain categories of professional and technical personnel for which more than 1,000 budgeted positions were reported.

Budgeted and vacant positions in 20 categories of health department personnel, about which information was requested, are shown in table 1. The entire range of positions is shown here for purposes of comparison among the basic classes of personnel and those representing occupational fields less commonly found. In this report, attention is directed to selected categories.

Types of Departments Reporting

Reports on budgeted and vacant positions were submitted by 1,301 health agencies (table 2). State health departments accounted for one-fourth of all budgeted positions and reported 12 percent of their positions vacant. County health departments accounted for 20 percent of the total budgeted positions and reported 9 percent vacant at the time of the survey. City health departments had the highest percentage of the total budgeted positions reported, and 9 percent were vacant.

Nearly half (44 percent) of the reporting local health agencies were single county health departments, providing services for almost one-third of the population covered in the survey. The percentage distribution by type of local health department and population served is shown in figure 2. Health departments classed as "Other" are, in general, one- or two-employee departments rendering limited services in rural areas.

Community Size

Of the 1,257 local health departments included in the study, only 2 percent were in the largest communities, those of 500,000 population and over (table 3). However, these departments accounted for 37 percent of the budgeted positions, and reported 9 percent vacant. Forty-three percent of the agencies were in communities of under 35,000 population. These health departments reported 9 percent of the budgeted positions, of which 12 percent were vacant.

The local health agencies participating in the

1951 survey which were located in communities of less than 35,000 population provided services for 12 percent of the population residing in health department jurisdictions. In communities with the largest population—500,000 and over—2 percent of the local health departments provided services for 28 percent of the covered population. Figure 3 shows—for communities of varying size—the extent of the relationship among the number of local health agencies, the population which they serve, and the number of budgeted positions. Communities range in size from those with less than 35,000 population to those of 500,000 and over. As may be seen, the percentage of budgeted positions bears a close relation to the proportion of population served in all except the largest communities.

More than one-fifth of the physicians, nurses, and sanitation personnel (sanitarians and engineers) of all county health departments were employed by the health departments in the smallest communities. On the other hand, small city health departments (those serving under 35,000 population) reported only 3 percent of the public health workers in these classes employed by all city health agencies. This suggests serious understaffing for providing even the minimum of essential public health services, and clearly indicates the need for consolidation of small municipal health departments into a broader base for more effective administration.

Military Reserve and Public Law 779

For the six selected professional and technical categories of health department workers previously mentioned, health agencies participating in the study provided information as to age, sex, position, and liability for military service. Physicians, dentists, and veterinarians were the first professional groups to be registered for military draft under the provisions of Public Law 779.

This law, a 1950 amendment to the Selective Service Act of 1948, required the registration of men under 50 years of age in medical, dental,

Table 1. Budgeted, filled, and vacant positions reported for professional and technical personnel of State and local health departments, continental United States [1]

Position [2]	Number of agencies reporting	Number of positions			Percent of positions vacant
		Budgeted	Filled	Vacant	
All positions	1,301	31,318	28,237	3,081	10
Graduate nurse	1,229	11,604	10,542	1,062	9
Sanitarian	1,094	5,469	5,166	303	6
Other (unspecified)	243	3,648	3,320	328	9
Physician	991	2,219	1,776	443	20
Bacteriologist	202	1,286	1,179	107	8
Engineer	245	1,083	928	155	14
Laboratory technician	187	1,028	929	99	10
Administrative management	179	749	706	43	6
Other technician	148	703	635	68	10
Public health investigator	227	618	578	40	6
Health educator	202	434	349	85	20
Dental hygienist	109	398	344	54	14
Dentist	136	357	281	76	21
Analyst and statistician	110	343	291	52	15
Chemist	79	337	314	23	7
Veterinarian	139	320	287	33	10
Nutritionist	78	212	179	33	16
Other medical social worker	65	208	170	38	18
Practical nurse	26	183	173	10	5
Psychiatric social worker	44	119	90	29	24

[1] Study conducted in 1951 for Health Resources Advisory Committee.
[2] Arranged in rank order of budgeted positions.

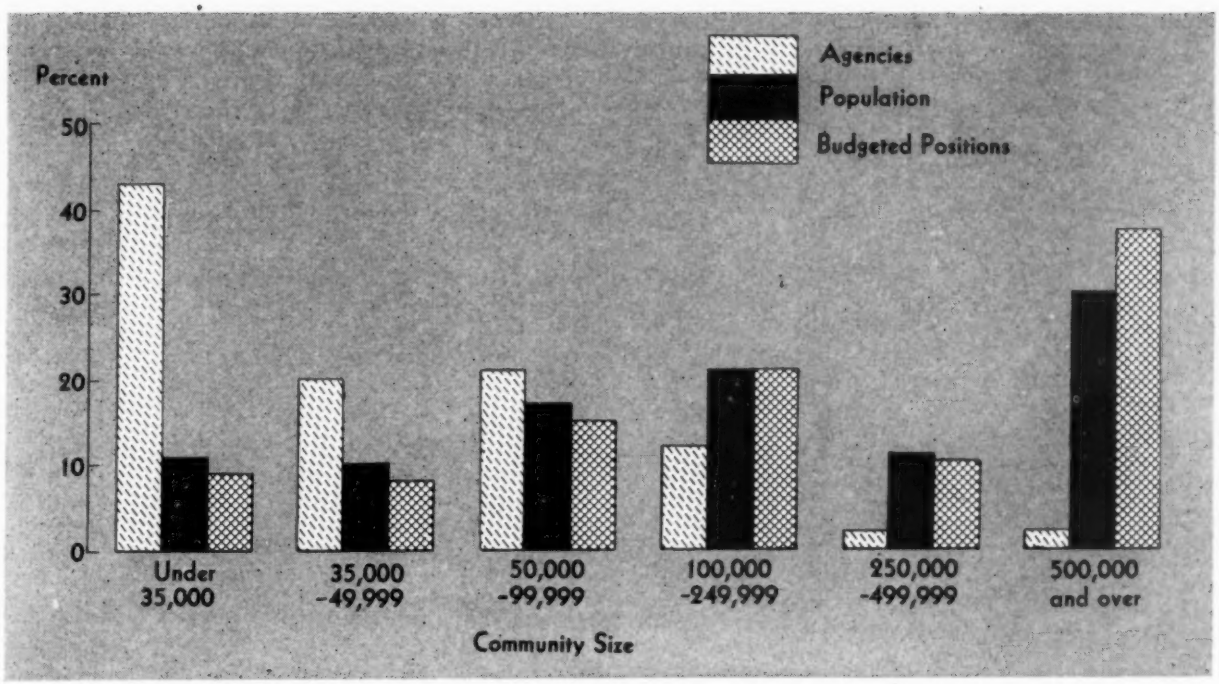

Figure 3. Percentage distribution of local health agencies, budgeted positions, and population served for communities of various sizes.

and allied specialist categories who were not members of a reserve component of the armed forces. The first registration, in October 1950, included physicians, dentists, and veterinarians in two groups: (1) Those who had participated in specialized training programs of the Army or Navy, or who had been deferred during World War II to pursue their education in one of the special categories and had less than 90 days of active duty in the armed forces or in the Public Health Service after completing their education; (2) the same groups, under the same conditions, who had 90 days or more but less than 21 months of such active duty. These two groups were assigned the first and second priorities for induction into the armed services.

Later registration included persons in the same specialist categories who were not included

Table 2. Number and percentage of agencies, budgeted positions and vacancies, and percentage of vacancies in budgeted positions for professional and technical personnel reported by State and local health departments, according to type of department

Type of department	All agencies reporting		Positions				Percent of budgeted positions vacant
			Budgeted		Vacant		
	Number	Percent	Number	Percent	Number	Percent	
All types	1,301	100	31,318	100	3,081	100	10
County	564	43	6,325	20	564	18	9
City	196	15	10,152	32	915	30	9
City-county	110	9	3,988	13	244	8	6
Local district	258	20	2,236	7	286	9	13
State district	48	4	610	2	98	3	16
Other	81	6	155	1	8		5
State	44	3	7,852	25	966	32	12

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Table 3. Number and percentage of agencies, budgeted positions and vacancies, and percentage of vacancies in budgeted positions for professional and technical personnel reported by local health departments, according to size of community

Size of community	Local agencies reporting		Positions				Percent of budgeted positions vacant
			Budgeted		Vacant		
	Number	Percent	Number	Percent	Number	Percent	
All communities	1,257	100	23,466	100	2,115	100	9
Under 35,000	538	43	2,136	9	260	12	12
35,000–49,999	249	20	1,952	8	199	9	10
50,000–99,999	267	21	3,435	15	291	14	8
100,000–249,999	146	12	5,008	21	399	19	8
250,000–499,999	32	2	2,380	10	214	10	9
500,000 and over	25	2	8,555	37	752	36	9

in the first registration and who had had no active duty after September 16, 1940. The final group included all men in the specified categories, not liable under the earlier registrations, classified according to the number of full months of active service, to be called upon when all those available under higher priorities had been inducted. These two groups were designated as priorities 3 and 4.

Among the 1,283 male physicians, dentists, and veterinarians under 50 years of age who were included in the survey, 33 percent were reported as having status in the military reserves or in priorities 1 and 2 under Public Law 779 (table 4). This group is most immediately subject to call for military duty as they are needed, either during the period of mobilization or in the event of national emergency.

In six selected categories of professional and technical health department personnel of all ages and both sexes, 10 percent were reported as having status in some component of the military reserves (table 5). It should be noted that more than one-third of all engineers reported are in this group.

Call to military service therefore threatens to deplete further the available public health workers. Of serious import is the fact that about one-third of all health officers and chiefs of service, those responsible for the direction and administration of programs and activities, are in either the military reserves or registered under Public Law 779.

Table 4. Military status of male physicians, dentists, and veterinarians reported by State and local health departments (through age 50 only)

Profession	Total	Military reserves or priorities 1 and 2	Percent
Total	1,283	429	33
Physicians	942	298	32
Dentists	189	73	39
Veterinarians	152	58	38

Resources and Needs

Physicians

Among the selected categories of professional and technical public health personnel, the shortage of physicians is perhaps of greatest importance in terms of impact upon health department operation. This critical situation is highlighted by the fact that 991 health departments reported 2,219 budgeted positions for physicians, of which 443 were vacant at the time of the survey. These were vacancies in established positions, and in the agencies where they occurred the full duties and responsibilities involved were not being carried on. The highest percentage of vacancies was in health departments in the smallest communities, where almost one-third of the budgeted positions were vacant. When budgeted positions for physicians average approximately one to each agency,

it is obvious that a health department with a vacant position is usually a health department without medical administrative leadership.

In State health departments, vacant positions do not necessarily imply lack of leadership in medical administration but are more likely to mean less effective operation of established services, delay in initiating new services, and an overloading of the physicians in the department. In many State health departments there is considerable "doubling up" of the direction of programs and services, so that a single physician will be responsible for the direction of one program and be designated as acting director of one or several others. This procedure is resorted to because essential services must have continued direction, and vacant positions simply cannot be filled. The percentage distribution of budgeted positions for physicians according to the size of the community, the type of department, and geographic area is shown in figure 4. The light areas represent the percentage of vacant positions reported. The geographic areas are:

Region	*States*
Northeastern	Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont.
Southern	Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia.
Central	Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin.
Western	Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

Two-thirds of the physicians reported were health officers or chiefs of service. Thirty-two percent of this group were in either the military reserves or registered in priorities 1 and 2 under the amended Selective Service Act. Thus, in the event of general call-up to the armed forces, health department operation and program direction and supervision would be jeopardized because of lack of leadership. Shortage of physicians in public health is not a new development, and it is unlikely that replacements would be generally available, even from staff workers in health departments. Most other physicians reported were at the staff level, with only 5 percent listed as consultants and supervisors.

Table 5. Professional and technical personnel in six selected categories reported by State and local health departments as having status in the military reserves

Category	Total	Military reserves	Percent
Total	21, 571	2, 186	10
Physicians	2, 074	371	18
Nurses	12, 044	691	6
Engineers	1, 071	411	38
Sanitarians	5, 758	590	10
Dentists	305	68	22
Veterinarians	319	55	17

Unquestionably, this study indicates that the shortage of physicians for service in health departments is critical. One-fifth of the budgeted positions for physicians were vacant at the time of the survey, and a large proportion of those presently employed are subject to recall or induction into the armed services. The problems of health department operation must therefore be considered in the knowledge that physicians are and will continue to be unavailable in anything like the numbers needed even to maintain present services. There must be a continuing critical analysis of the activities of medical personnel, looking toward the most effective utilization of those now serving in official health agencies. Consideration should be given to ways of supplementing their services by a greater use of part-time clinicians and of nonmedical assistance in those activities which can be delegated to such personnel.

Nurses

In an article on "Nurse Power in Mobilization," Ruth P. Kuehn (*1*) stated: "A critical deficit in nurse power is already upon us, and this deficit is steadily increasing." The deficit in health department nurses was indicated in the 1951 survey, which showed that 1,062 budgeted positions for graduate nurses were vacant. As with physicians, these vacancies

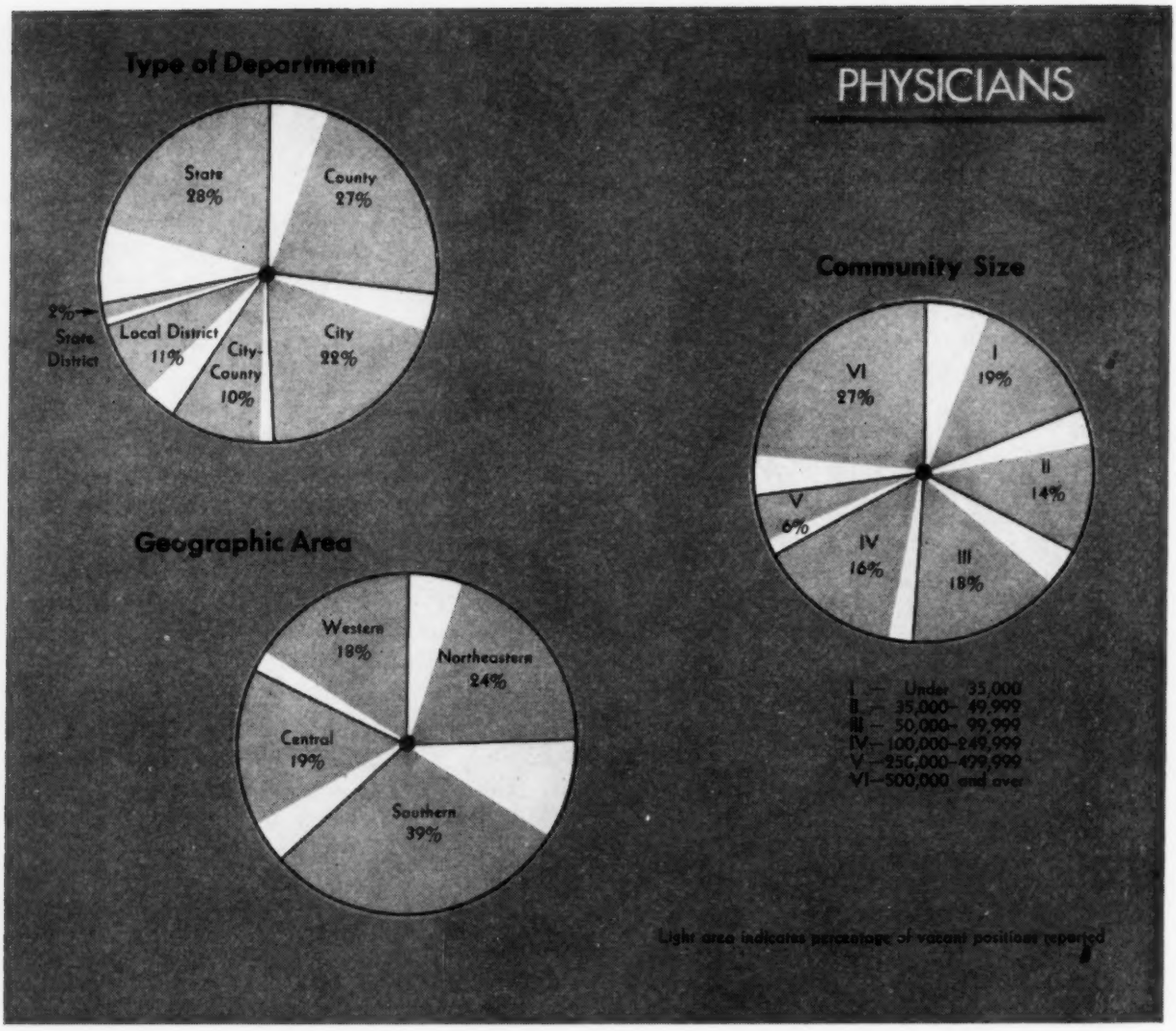

Figure 4. Percentage distribution of budgeted positions for physicians reported by State and local health departments according to type of department served, and for local health agencies according to community size and geographic region.

in budgeted positions represent pressing needs for nurses in established positions for which funds were available and which were unfilled because of the shortage of "nurse power."

It is recognized that in many communities visiting nurses and school nurses work closely with health departments, and in some instances carry a considerable share of the nursing load. However, this study deals only with health department nurses.

Nurses in health departments serve all programs and provide the hard core of services in the field of personal health, the essential routine tasks of home and school visits, of health education and its application to personal living, among many other duties. In this important basic service, 1 budgeted position in 10 was vacant. Needs for additional nurses reveal the greatest deficiency in total numbers in health department personnel. The number of vacant budgeted positions represents about one-tenth of the total number of nurses who would be needed to bring existing health units up to minimum standards—approximately 10,000 rather than 1,062 as reported. For nurses, as for physicians, there must be a continuing critical analysis of activities to assure the most effective utilization of those now employed in offi-

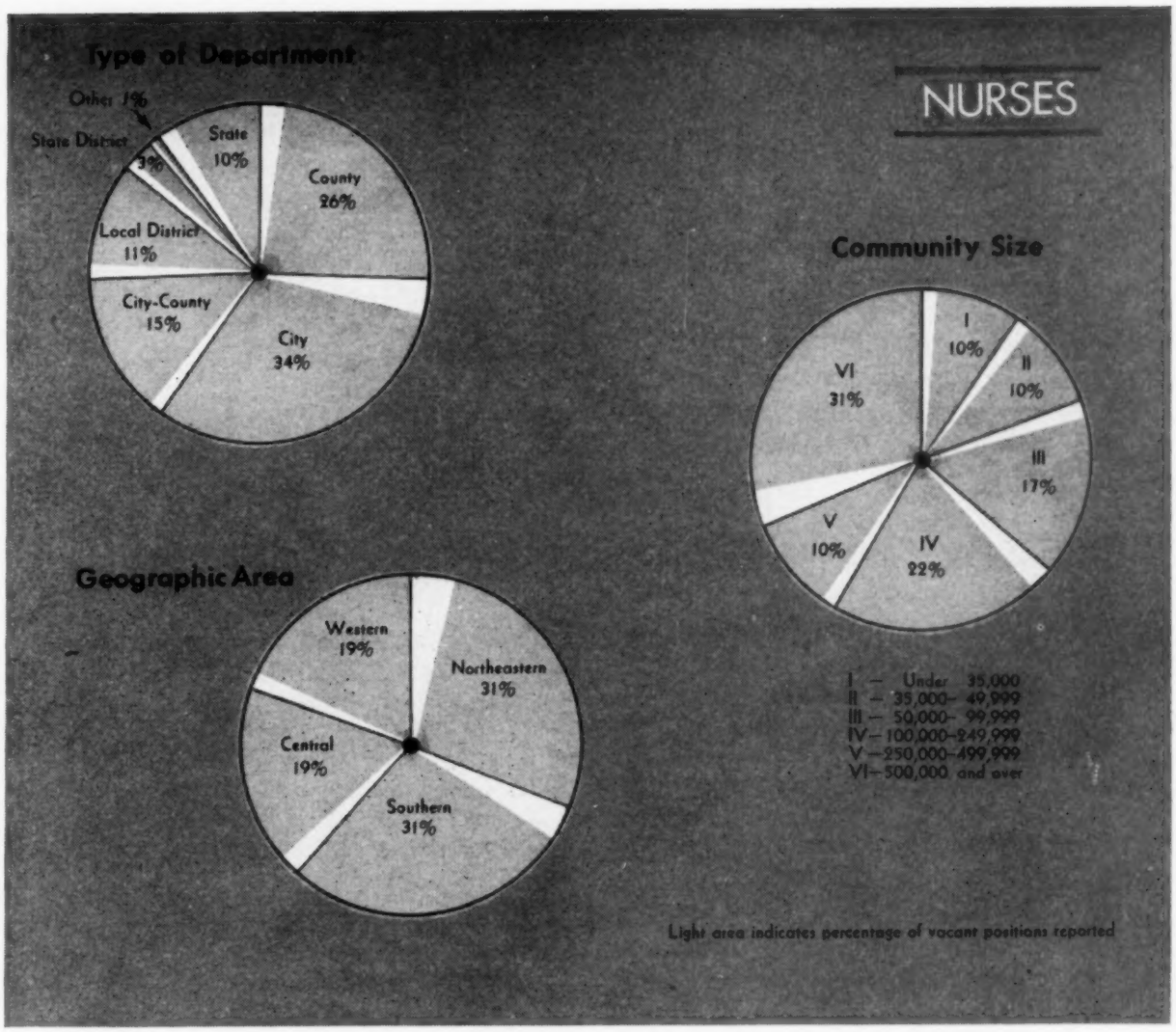

Figure 5. Percentage distribution of budgeted positions for nurses reported by State and local health departments according to type of department served, and for local health agencies according to community size and geographic region.

cial health agencies and to explore and evaluate the potentialities of supplementary workers without the technical skills and training of the qualified nurse.

Shortages of nurses were reported in all types of departments and in communities of every size in every State. The percentages of budgeted positions for nurses according to size of the community, type of department, and geographic region are shown in figure 5. The light areas represent the percentage of vacancies in each category.

Health departments provided information concerning 12,044 nurses. The median age, in an occupation for which preparation is completed at a relatively early age, was 41 years—somewhat older than might have been expected. Since only 6 percent of the total number of nurses reported status in the military reserves, it would seem that depletion of the nurse supply in health departments is not particularly due to their being called to active military service. Many nurses, however, are joining the armed forces. Most of the vacancies reported because the incumbents had entered active duty were in nursing positions.

Only 369 nurses were reported as chiefs of service or health officers. The greatest number

of nurses were staff workers, with about 8 percent reported as supervisors and consultants. The shortage of nurses, therefore, bears directly on the provision of day-to-day actual services to individuals, rather than on program direction or leadership, as in some of the other occupations. The nursing profession, which women enter fairly young and leave because of marriage, family responsibilities, and the like, does not have an adequate reserve supply from which to provide replacements. To quote again from Mrs. Kuehn's article, "The present supply of nurses must meet all needs until more graduate nurses can be produced." At present, the production of nurses is insufficient to meet the demands.

Sanitarians

The third member of the team in providing minimum essential public health services is the sanitarian. Like the nurses, sanitarians carry on the routine tasks essential in safeguarding the public health. Such important duties as the inspection of facilities for storing and serving food, maintenance of safe water supplies, and provision of physical environment favorable to personal health are assigned to the sanitarian.

Activities concerned with environmental sanitation are essential to the health and welfare of all communities. The concentrated populations in urban communities, and more recently in and near military and industrial centers concerned with defense activities, make sanitation services in these areas of vital importance. Although the rate of vacant positions for sanitarians was relatively low, the urgency of maintaining the full range of their services gives these vacancies added importance. As with physicians and nurses, the budgeted positions for sanitarians by no means reflect total need. If all presently organized health departments were to meet minimum staff requirements, it is estimated that more than 1,600 additional sanitarians would be needed.

County health departments were most numerous among the agencies reporting budgeted positions for sanitarians. However, the greatest number of positions were in city health departments, 156 of which reported 2,312 budgeted positions, with 98 vacant. The distribution of budgeted positions by community size, by type of department, and by geographic area are shown in figure 6. Light areas indicate the percentage of vacant positions in each category.

State and local health departments listed 5,758 sanitarians employed at the time the study was made, with only 62 women sanitarians reported. The employment of women in greater numbers in this field might be suggested. It seems reasonable to believe that they would be successful, especially in the inspection and supervision of the servicing of food.

Only 10 percent of the sanitarians reported status in the military reserves. Although they are a relatively young group and they may be taken into the military services, their replacement would be less difficult because many sanitarian jobs can be filled by personnel with less professional preparation than can other types of public health positions. Most of the sanitarians were listed as staff workers, and many of them were listed as the only worker in their field in the reporting agency.

Engineers

In the larger local health organizations and in State health departments, sanitary engineers are employed not only for the handling of and consulting on the more complex aspects of environmental sanitation, but also for the direction of environmental health programs. Their specialized training and skills are required for the supervision of sources of water supply and for the planning, construction, and operation of water treatment systems and sewage treatment and disposal systems; for dealing with problems of water and air pollution, and of industrial health hazards. Because of their specialized training and experience, the services of sanitary engineers are in immediate demand whenever disaster strikes. In the event of a military attack on the United States, and in areas devastated by floods, fires, or tornadoes, they are needed to provide front-line defense against the health hazards that follow serious disruption of environmental sanitation facilities and services.

The demand for sanitary engineers is not limited to official health agencies. Their services are sought by organizations which plan and develop industrial installations involving safe

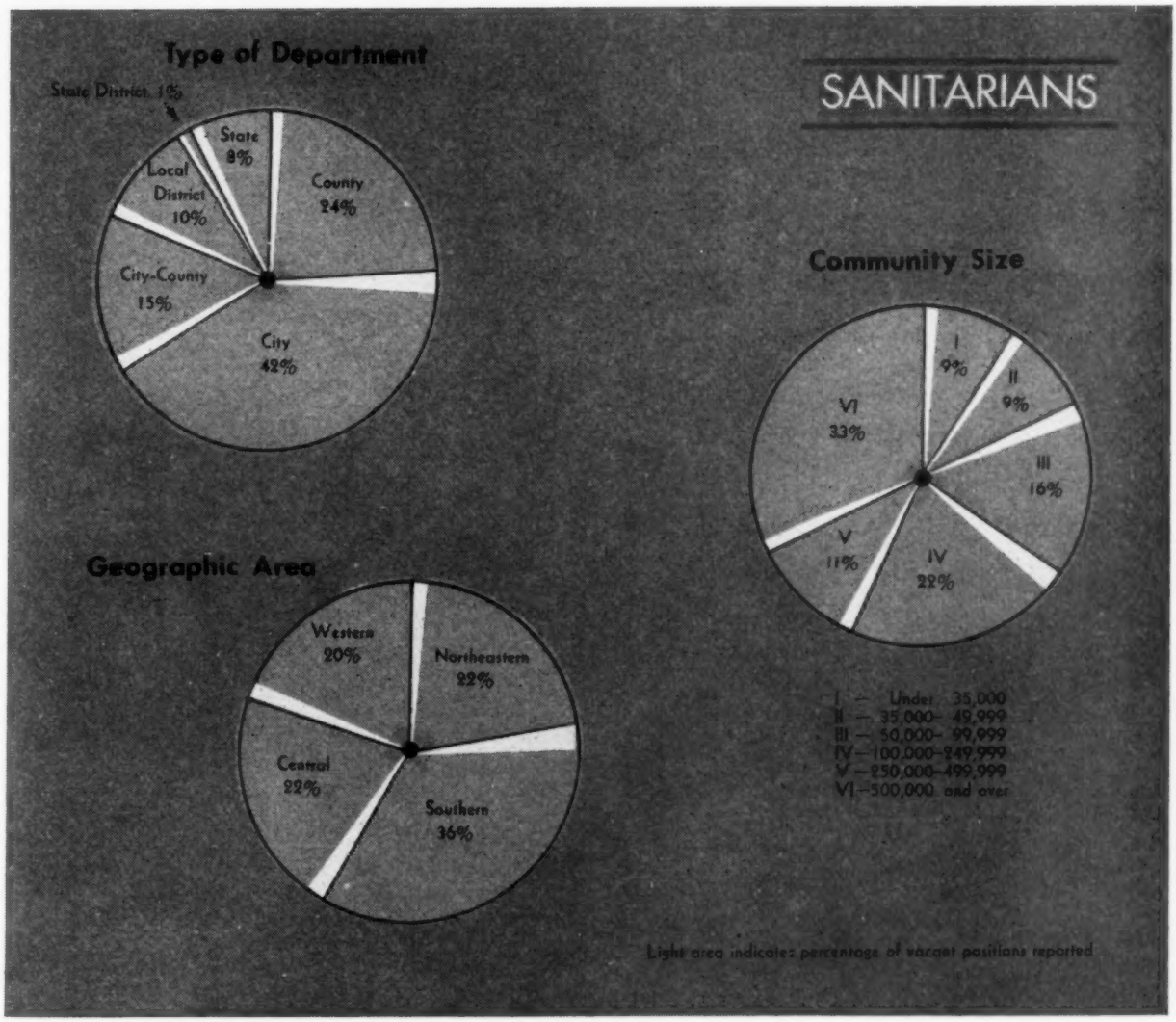

Figure 6. Percentage distribution of budgeted positions for sanitarians reported by State and local health departments according to type of department served, and for local health agencies according to community size and geographic region.

and healthful environment, by planning commissions and boards concerned with watersheds, by interstate public carriers, by water pollution control agencies, consulting firms, public works agencies, industry, and academic institutions. The needs of the armed services may well place an additional drain on the limited numbers available in the field of sanitary engineering.

Engineers were the youngest among the six groups for whom age information was supplied. In view of the fact that 38 percent were reported as having status in the military reserves, and are largely of an age to be called to service in case of need, health agencies face a potentially acute problem of depletion of their already limited resources of engineering staff. The greatest number of engineers reported military reserve status in the Army; only a small number were reported in Public Health Service Reserve components. Engineers have not been registered under Public Law 779 up to the present time.

Among all occupational groups in health departments included in the survey, engineers ranked sixth in the number of budgeted positions reported, and seventh in percent of budgeted positions vacant. However, among the six selected categories of public health personnel—

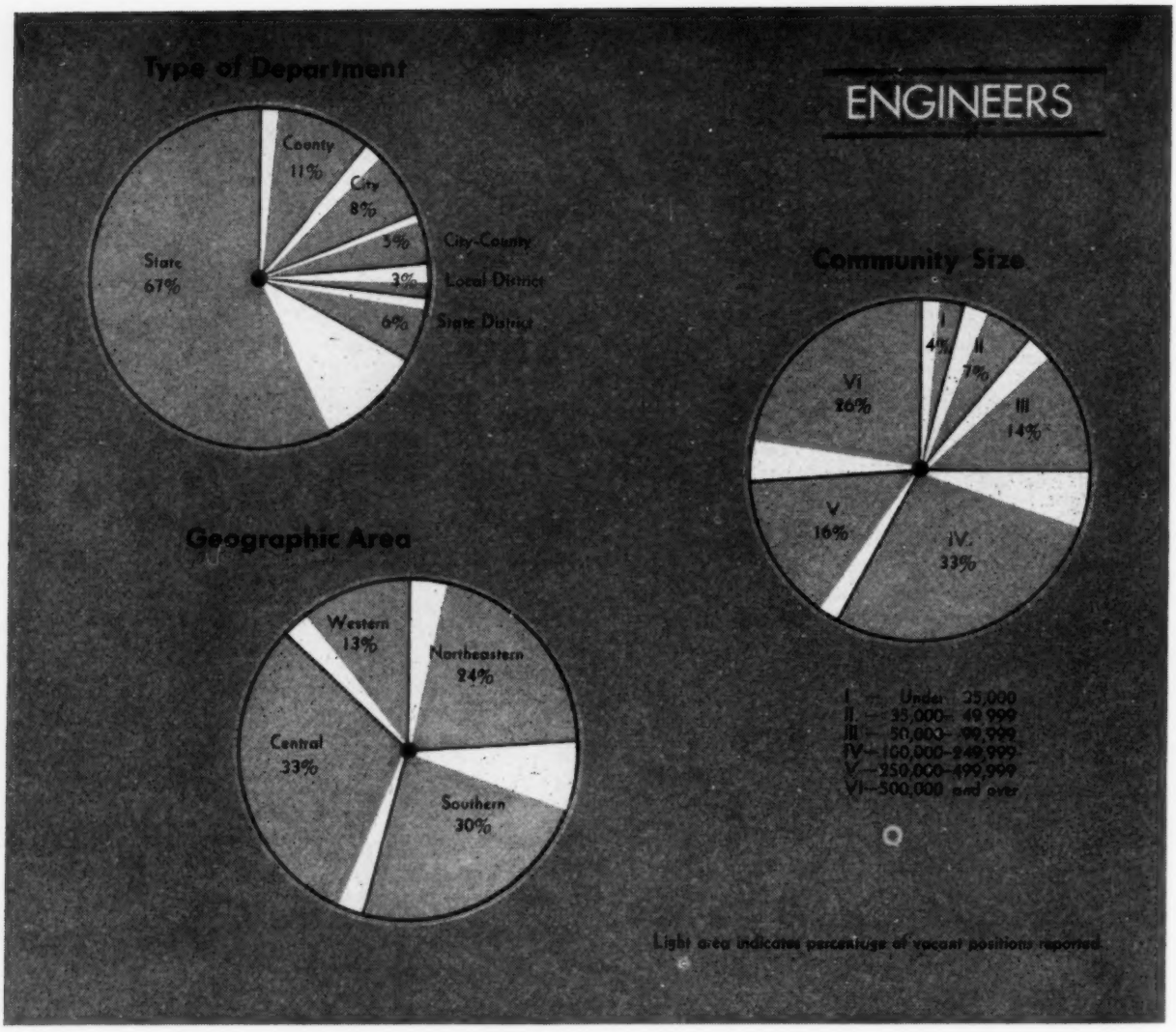

Figure 7. Percentage distribution of budgeted positions for engineers reported by State and local health departments according to type of department served, and for local health agencies according to community size and geographic region.

physicians, nurses, engineers, sanitarians, dentists, and veterinarians—engineers had the third highest percentage of vacancies in budgeted positions. In view of the specialized nature of their work, it was not surprising to find most of them employed in State health departments. Budgeted positions distributed by size of community, type of department, and geographic area are shown in figure 7. The light areas indicate the percentage of vacancies in each category.

Dentists and Veterinarians

Dentists and veterinarians are employed in limited numbers in State and local health departments, although there has been a growing recognition of their place in public health.

Public health agencies have been developing programs of dental public health for a number of years. However, in the 1951 survey, budgeted positions were reported by only 136 health agencies, 98 of which were local and 38, State health departments. As was noted earlier, the vacancy rate in budgeted positions for dentists was among the highest reported. More than half of all budgeted positions were in the largest communities. Vacancy rates were relatively high in communities of all sizes, and in all types

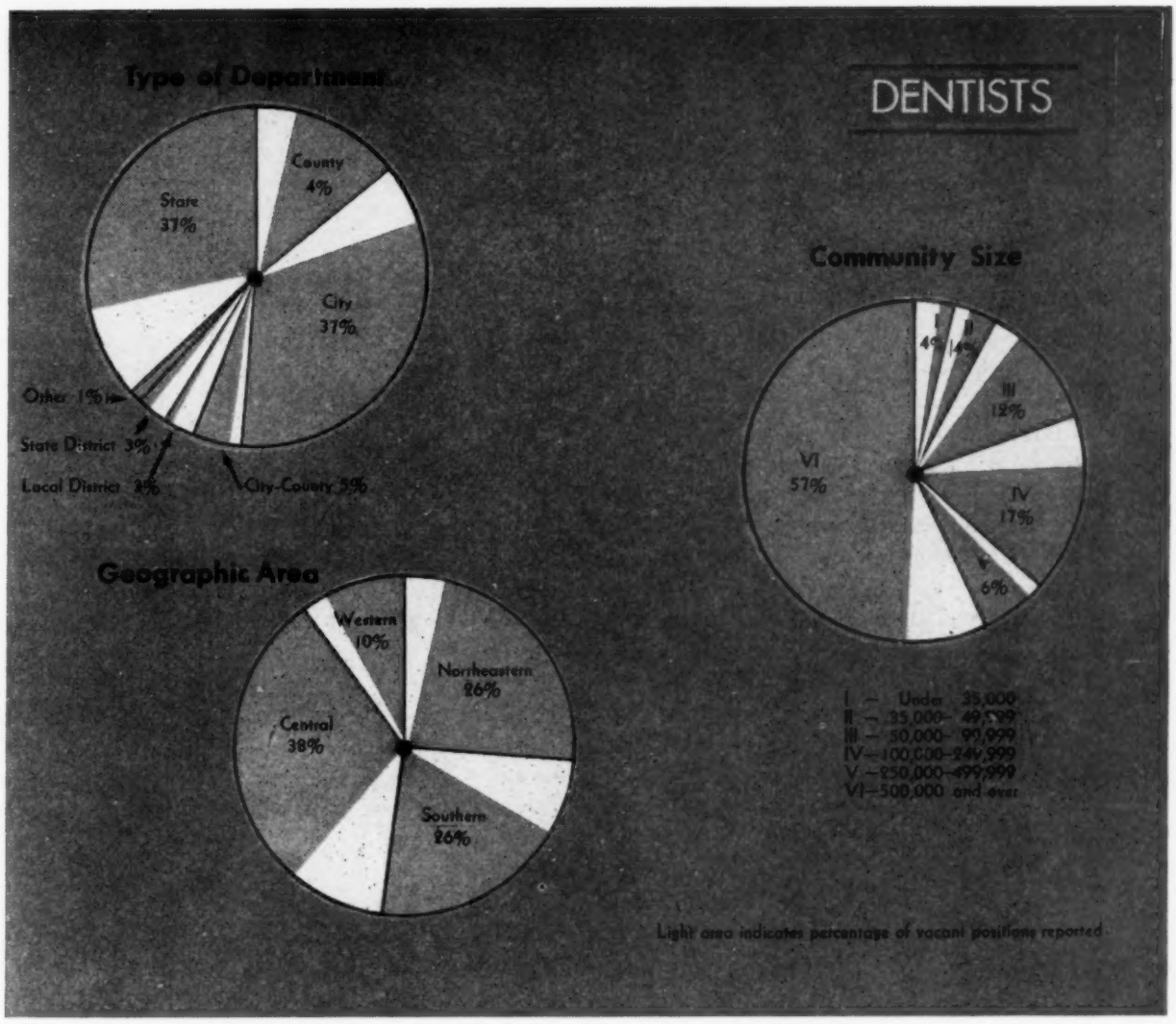

Figure 8. Percentage distribution of budgeted positions for dentists reported by State and local health departments according to type of department served, and for local health agencies according to community size and geographic region.

of departments, as indicated by the light areas in figure 8.

Until comparatively recent years, the duties of veterinarians in public health agencies were closely related to those of inspectors in the field of environmental sanitation. However, with emphasis being placed on the control in animals of diseases transmissible to man, a separate professional category has gained recognition in the public health field. It is probable that in the present survey many of the veterinarians whose duties were still largely concerned with the inspection of meat, poultry, meat products, and related activities were reported as sanitarians. This would account in part for the fact that only 139 agencies (126 local and 13 State health departments) reported budgeted positions for veterinarians. The veterinarians were located mostly in the largest communities and in city health departments, with few veterinarians reported in State health departments. The distribution of budgeted positions, with the light areas indicating vacancies, is shown in figure 9.

Because of the small numbers of dentists and veterinarians reported by State and local health departments, the age distribution, status in the military reserves, and priorities established under Public Law 779 are only indicative of the

problems to be faced in filling vacant positions and in enlarging or extending present services in these fields. Almost half of the dentists and one-third of the veterinarians were in either the military reserves or registered in one of the four priorities under the amended Selective Service Act.

With the present shortages of both dentists and veterinarians, even the complete staffing of programs now in operation presents serious problems. The possibility of extension or expansion of work in either dental public health or the field of veterinary medicine seems extremely unlikely, except perhaps through a more general use of supplementary personnel. In public health dentistry, dental hygienists are being used in a relatively small number of agencies. They too, however, had a fairly high rate of vacancies at the time of the survey.

The work of the trained public health veterinarians may be extended to a certain extent by sanitarians. However, wider incorporation of such programs within basic public health services will be seriously restricted until the supply of trained personnel is greatly increased—a day which at this time seems far in the future.

Ratios as a Measure of Needs

Although the use of ratios in determining needs for personnel has many limitations, they do provide some measure of need when care is taken in their interpretation. Recommended ratios of public health personnel to population, as determined by authorities in the field, specify 1 physician as health officer in each organized health department plus 1 physician for each additional 50,000 population living within the health department's jurisdiction. For nurses, the recommended ratio is 1 to 5,000 persons if bedside nursing care is not included, 1 to 2,000 when bedside care is provided; for sanitarians, 1 for 15,000 population.

These minimum staffing requirements, developed over a period of years by representatives of official and nonofficial health agencies working together, represent a concensus of professional judgment. The great disadvantage in using ratios to determine needs for public health personnel is that problems vary greatly in different communities, in different parts of the country, and with differing emphasis given to particular programs and areas of interest. However, there must be some common basis from which to measure personnel requirements, and ratios carefully used provide such a base. Under any circumstances, there could be no firm statement that health departments of a certain kind in a certain community would need a given number of persons to carry out a "public health" program. The best estimates are merely that—a rough measurement of needs—and ratios provide the means to make such general measurements.

Ratios of Reported Personnel to Population

In all health departments included in the 1951 survey, regardless of the size of community served, the personnel available in relation to the number of persons within the jurisdiction was far from the recommended ratios. The ratio of nurses and sanitarians to population was in general fairly constant. It showed 1 nurse for 10,000 to 12,000 persons. Sanitarians averaged 1 to about 25,000, except in health departments in communities from 250,000 to 500,000 population, where the number of persons per sanitarian was about doubled. The ratio of persons to health department physicians increased as the size of the community served by the health department increased, ranging from 1 physician for 45,000 persons in the smallest communities to 1 for almost 120,000 in communities of 250,000 to 500,000. In the largest communities (those of 500,000 and over), the average was 1 physician for about 75,000 people. In these larger communities, however, the problem may be less serious since it is somewhat easier to extend the services of the public health physician by a greater utilization of part-time clinicians.

Summary

The health manpower survey has not only confirmed the generally known facts concerning shortages of trained public health workers, but has also identified specific critical situations arising from these shortages. In health departments in 1951, 10 percent of all budgeted

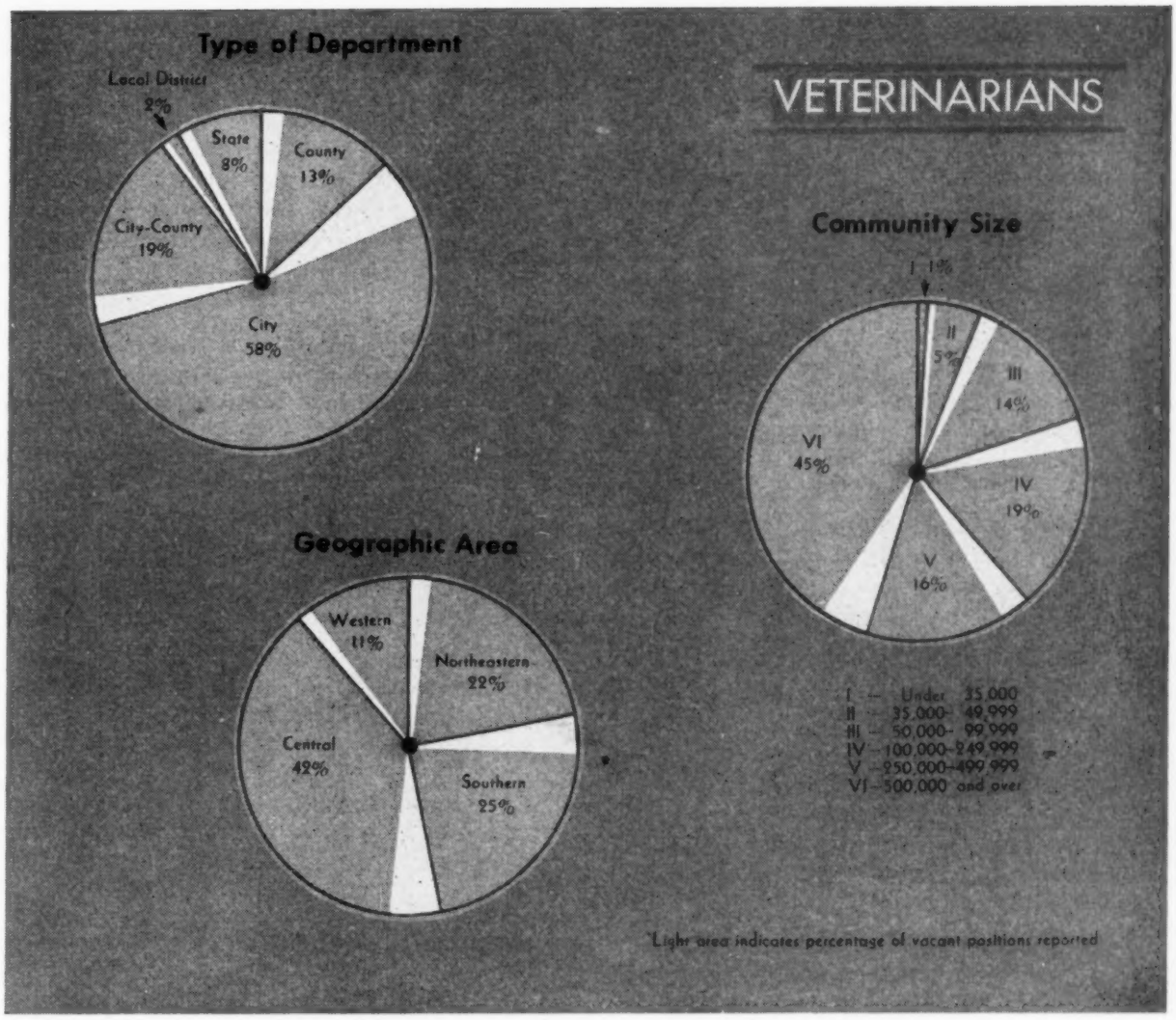

Figure 9. Percentage distribution of budgeted positions for veterinarians reported by State and local health departments according to type of department served, and for local health agencies according to community size and geographic region.

positions for professional and technical personnel were vacant. Vacancies were especially numerous in positions for physicians, nurses, and engineers—professions essential to public health program operation.

In budgeted positions for physicians, 443 were vacant. There were 1,062 positions for nurses and 303 for sanitarians reported vacant in the 1951 survey. Vacancies in budgeted positions represent only a fraction of total need for public health personnel. To bring existing local health departments up to minimum recommended standards, it is estimated that there would be need for nearly 1,000 physicians, more than 10,000 nurses, and about 1,600 sanitation personnel, including both sanitarians and sanitary engineers. To extend basic minimum services in organized health units to the entire country would require in the neighborhood of 1,600 physicians, 13,700 nurses, and 4,000 sanitation personnel.

Most significant to the operation of presently organized health departments, and to the expansion of public health agencies to areas not now covered, is the shortage of physicians. Shortages of engineers are almost equally serious, in view of the nature of their work and the demands for their special kinds of services

in a period of national emergency. Although the shortage of nurses is very large, it is believed that the reservoir of trained nursing personnel—such as nurses who have withdrawn from active participation in health programs for personal reasons—could be drawn on to provide nursing services in the event of a military or natural disaster. They might also be called on to staff new agencies, to provide new services, and to participate in nursing activities at least on a part-time basis if the need arises.

The considerable numbers of public health personnel reported as having status in some component of the military reserves or as liable to call under the amended Selective Service Act, pose additional problems. These public health workers may well be lost to official health agencies because of the needs of the armed forces. There is scant hope that a greatly increased supply of public health workers will be available while the mobilization for defense, with its extensive manpower requirements, continues.

During this period, a demand of formidable proportions for trained public health personnel will build up, which, under the most favorable conditions, will take years to meet. In view of the findings concerning present health organizations and methods of utilizing available personnel, it is essential to make a purposeful examination of present operations and by prompt and vigorous action to correct wasteful and inefficient practices wherever they exist.

ACKNOWLEDGMENT

The author acknowledges the assistance of the Division of State Grants of the Public Health Service in planning and conducting the survey of health manpower in State and local health departments. He is indebted to Dr. Marion Ferguson for planning the collection and analysis of the data and for the preliminary tabulations and reports, and to Bess Cheney for assistance in preparing the final tabulations, analyses, and the text of the report.

REFERENCE

(*1*) Kuehn, R. P.: Nurse power in mobilization. Am. J. Nursing **5**: 395–398 (1951).

Training Course in Environmental Health

Fourteen technical training courses will be offered by the Public Health Service Environmental Health Center, Cincinnati, Ohio, during fiscal 1952. The first, a course in basic radiological health training, is scheduled for October 6–17.

In addition to seven courses in radiological health, courses will be conducted in the fields of water pollution abatement, sewage, industrial waste and water treatment, milk and food sanitation, and atmospheric pollution control. The courses are designed for professional personnel from State and local health departments, water pollution control agencies, the Public Health Service, and other governmental units. Industrial representatives who are cooperating with these agencies in environmental sanitation and radiological health programs are also eligible to attend.

A bulletin giving the complete schedule, descriptions of the courses, and application information may be obtained upon request from the Officer in Charge, Environmental Health Center, Public Health Service, Cincinnati, Ohio, or from Federal Security Agency Regional Offices.

STATISTICS

Public Health Reports publishes in this and later issues a group of papers presented before the Second Conference on Public Health Statistics held June 16–20, 1952, at the School of Public Health of the University of Michigan.

This second conference—the first was held in 1948—was designed for health officers, program directors, and public health statisticians. These and other professional groups and disciplines were represented in discussions which ranged over a wide array of topics . . . the use of statistics in State and local programs, in general and specialized programs, in administration, in evaluation. Special attention was given to current developments and potentialities in survey and sampling methods.

Vistas in Public Health Statistics

By CLARENCE J. VELZ, M.S.P.H.

By whatever means one projects into the future, there appear on the horizon broadening functions and challenging fields of labor for the public health statistician. With this increase in scope one sees the public health statistician occupying positions of greater and greater responsibility on the public health team. One also sees closer day-to-day relation between the administrator and the statistician in planning, executing, and evaluating public health programs.

The public health statistician, however, should not be expected to bring suddenly into bold relief straight and unerring paths to success in all public health effort. The statistical method is an aid, but it is not a substitute for thinking and creative imagination. However, no administrator is so rash as to venture forward without the aid of this powerful tool. Thus one sees the public health team venturing forward, led by a courageous and imaginative administrator with the public health statistician at his side, sounding, probing, testing, sifting, evaluating.

That this opportunity is not a mirage but a reality is fortified by today's changing concept of public health, the pressure of expanding functions and new problems, and the increased power of new statistical tools. The public health task is conceived today to be the provision of not only an environment in which man can survive, but also one in which he will thrive. In the early years the task was conceived primarily as the conquest of the ravages of communicable disease. While the potentialities of

Mr. Velz is professor of public health statistics and chairman of the department of public health statistics, School of Public Health, University of Michigan, Ann Arbor. *This paper was presented June 16, at the Second Conference on Public Health Statistics at the University of Michigan.*

epidemic disease still exist, today in the public mind the threat to survival is remote, and emphasis is shifting from "survive" to "thrive" with demand for positive health.

This changing concept greatly broadens the field of action. It also complicates and makes more difficult definition of problems and measurement of results. With the shifting of emphasis from survive to thrive, the basis for action is more vague and difficult to define and the measure of effectiveness more intricately interwoven with other public services.

There is no one short sure road to positive public health. Some roads may prove to be blind alleys; some may prove to be exceedingly expensive excursions; others may not appeal to the American way of life. Nor is the public health profession the only one in the field competing for public support on the road to that goal of "a better life." This much is certain: the public health team must justify the selection of the roads it takes and demonstrate that it is consistently moving toward the goal and not just traveling blind.

New Measurements

To chart these paths and mark progress is a challenge to the whole public health profession and particularly to the public health statistician in development of new measuring devices. At one time, death rate was an all-inclusive yardstick by which a problem could be defined and progress marked. From this simple, direct device the future leads to an ever-increasing chain of complexity: recording of births and deaths; partial reporting of communicable disease; shift from acute epidemic to chronic disease; shift from mortality summaries to morbidity surveys; periodic and then continuous sickness surveys; and finally, measurements in terms of positive physical and mental well-being and an environment conducive to thriving.

Although sights may be set on thriving and goals of positive health, it is not implied that competitive and self-inflicted hazards of life are all removed. Life probably always will remain a battle to survive. Hence, with the changing concepts of public health, new functions do not replace old responsibilities. There remains, always, the important work of improving accuracy and completeness of recording, of extending, not diminishing, communicable disease reporting, and of expanding generally the usefulness of mortality and morbidity data.

In the early days the administrator had very little need for services of the public health statistician beyond record keeping. Today the situation is quite different. In light of changing concepts of public health, it is inevitable that the public health administrator and the whole public health team are destined to lean more and more heavily on the public health statistician for aid in charting paths, appraising programs, and measuring progress.

In addition to the long-range influences associated with changing concepts of public health, new problems and expanding functions are already appearing. They are demanding immediate extension of the services of the public health statistician in environmental health, industrial health, medical care programs, community planning, and in over-all departmental management.

Environmental Health

One sees in the future a vast expansion of work for the public health statistician in the field of environmental health and a much closer working relation between the public health statistician and the public health engineer. We have been inclined either to view man as an isolated case independent of his environment or to deal with the environment as independent of the individual. Actually, man is inseparable from his environment. The trend is toward integration of the total environmental situation in which modern man lives and through this complex and varied context to identify and provide the beneficial and eliminate or control the detrimental. In this task the statistician can be of great assistance to the engineer.

As we proceed from the concept of survive to that of thrive, much that is undertaken in the name of environmental health will not be measurable in terms of death rate, or even sickness rate. Sensitive measures of environment itself and its relation to well-being must ultimately evolve.

Water Contact

Consider the water contact. The battle against stream pollution has been held back for years because of the old negative point of view written into public health law requiring demonstration of injury to health before corrective action could be enforced. Today State after State is in process of changing laws from a negative to a broad positive concept of multiple uses of streams, a concept which includes such intangibles as recreational value. No longer is it necessary to show that someone dies or becomes ill as a justification for pollution prevention and control of the water contact. Here, again, statistical methods must be applied to stream analysis and the evaluation of the mass of operational control data required of municipal and industrial water supplies, waste-treatment effluents, bathing beaches, and fishing and recreational areas.

Air Contact

Similarly, in the air contact, the concept is broadening to include not only the indoor industrial hazard but also outdoor atmosphere, including climatological aspects, fungi and pollen pollution, as well as industrial and smoke pollution. We can well profit from the experience gained in dealing with the water contact and avoid the negative approach of requiring demonstration of injury to health. Positive measures are needed, and again statistical methods must be used in defining and evaluating approaches to control in terms of positive health.

Food Contact

There is certain to be a decided extension of the use of statistical methods in dealing with the food contact. Evaluation procedures now employed lean heavily upon provision of physical means of handling and processing, without adequate supporting evidence of the value of these means in terms of real quality. One of the most pressing needs in food control is the development of more efficient objective measures of quality in terms of end results of food products consumed. There is also certain to be increasing demand for assistance of the statistician in evaluation of nutritional problems.

Industrial Health

Another fertile area for labors of the public health statistician is industrial health. A number of public agencies are now concerned with this problem, while private industry is attempting to deal with the problem on a within-plant basis. The trend is toward integration of effort, both governmental and private, aimed at the total problem. The division between health problems which occur within industry and those which occur in the community is artificial. For example, industry has already discovered that absenteeism from nonoccupational injuries and illness by far exceeds that associated with occupational. The statistician with a public health viewpoint can assist, first, in setting up record systems in industry and in government agencies which will be interlocking and, second, in analyzing and evaluating health problems which have a reflection in production manpower. This should mean not only better over-all community health, but dollars and cents to industry.

Medical Care

A new field, at least in the United States with great potential demand for services of the public health statistician is that of medical care programs. Whether these develop to be public or private programs, the need for assistance from the statistician will be equally acute. Record systems, the definition and scope of programs, the types and number of services, the control of panels and equitable payments by those who receive service and the physicians rendering service, and fiscal and administrative management offer opportunities to the statistician.

Community Planning

A challenge is extended to the public health statistician to participate to a greater extent in community planning, particularly in providing practical long-range population forecasts as a basis for rational design. Every community endeavor is ultimately related to the problem of population change. All of the medical services and environmental controls—hospitals, clinics, water and milk supply, sewerage and

sewage disposal, refuse collection, and housing—are projected on the basis of population.

Although the individual is the basic unit, in practice the planning and administration of these services and facilities is developed on a community basis. Community development requires years in promotion, planning, and construction; consequently, its adequacy depends upon our ability to anticipate future needs. Every index points to a leveling off of population growth from the steep rates of the past toward population saturation. In this transition, estimating future needs becomes increasingly difficult.

Projection of future growth on the basis of the steep midstage rates unquestionably would result in spending vast sums for facilities for which, most probably, no population will exist. Furthermore, such misplaced expenditures would be reflected in shortages of funds for new types of facilities and services needed in the transition to population saturation. Accordingly, it becomes increasingly important to measure and evaluate characteristics of community growth and population change. The emerging patterns of community growth go beyond birth, death, and migration rates to the underlying force of economic opportunity. In a free, mobile society, such as the United States, migration is extremely sensitive to the socioeconomic opportunity offered by a community. Quite aside from biological factors of fertility, the will to have children is also strongly influenced by economic opportunity.

In defining community growth, more than mere consideration of the number of individuals is involved. Some basic questions need to be studied: How old are our cities? What is their limit, their life span? What is their present stage of development and what are the logistic characteristics of their growth curves? Is each community a law unto itself or are there marked common characteristics which are quantitatively referable to underlying forces?

Preoccupation with argument about world population in the mass has often kept the experts from considering the practical down-to-earth needs of the community. It takes courage to venture a population forecast for specific practical purposes for a specific community. Too frequently, knowledge of all the refinements of population growth drives the expert into the shelter of his ivory tower and robs him of the courage needed to make a clean-cut practical forecast. On the other hand, ignorance too frequently leads to irresponsible boldness and vast expenditures of public funds for under- or over-designed facilities.

These are but a few of the expanding problems destined to increase the demand for services of the public health statistician.

New Statistical Tools

The power and economy of new statistical tools now developing is a potent force in itself, propelling the public health statistician into positions of greater opportunity for service. I venture to predict the future will show that the applications of modern sampling survey methods mark the beginning of a vast new era in public health. As we deal with the more complex social and environmental problems, this modern instrument of the statistician will come into wider and wider use in defining and evaluating progress toward positive public health. For the first time within the grasp of the administrator, there is available an instrument of efficiency in time, cost, and effort which can frequently be employed in measuring community-wide needs, problems, and progress.

Also, through the advances in mechanization for handling mass data, such as the newer electronic machines, it will be possible to undertake massive and complex analyses heretofore prohibitive because of sheer bulk.

This, indeed, is a promising and challenging vista. It is hoped that the administrator, by a better understanding of the power and economy of the statistical tools, will continue to expand their application and to utilize more fully the potentialities of the statistician. The public health statistician must welcome these added responsibilities. He must speak a language understandable to the administrator and the public. He must leave, for a moment, argument concerning refinement of theory and come to grips with practical application. If the public health statistician is to measure up to the challenges ahead, he must take the initiative in offering his services to the entire public health team.

Application of Statistical Analysis In a Health Program

By RUTH R. PUFFER, Dr.P.H.

The statistical program is an integral part of health programs just as are the medical, nursing, and sanitation programs. In fact, the statistical aspects are often so much a part of the administration of a program that it is difficult to separate the statistical from the administrative.

Because of the administrative use of statistics, the statistician works with the health officer, the epidemiologist, the clinician, the nurse, and others in planning and developing programs and in applying statistical analyses for their guidance. This teamwork begins when plans are being made for the initiation of a new program to insure collection of proper data for administrative purposes and for continual evaluation.

Statistical analysis is used here in a broad sense to include records, and collection, processing, and tabulation of data, as well as analysis and interpretation—all essential parts of statistical work. The success of a program may depend on the vision shown when the records are designed. The records must have sufficient data for administration, for evaluation, and sometimes for research. Space must be provided for the data required for analysis. Satisfactory procedures for collection and completion of the records should be developed in the planning stage. The method of processing and tabulating the data is important. If mechanical means are needed, plans for codes for punching and tabulating are part of the initial planning. Selection of the best method of analysis and of correct interpretation of the the results are important phases of statistical work.

In planning the statistical phases of a program, study, or experiment, the specific objectives should be stated and the collection of data directed to fulfilling those aims. The objectives and methods will vary in each program.

Dr. Puffer, director of statistical service in the Tennessee Department of Public Health, presented this paper at the Second Conference on Public Health Statistics, School of Public Health of the University of Michigan, Ann Arbor, June 16.

Presents a Challenge

The application of statistical analysis, used in the broad sense, to planning, operating, and evaluating a health program differs in every field in which services are provided. No single pattern applies to local health department activities, to work in maternal and child hygiene, to cancer control, and to other programs. Statistical analyses vary from descriptive statistics to applying life table methods to data collected for use in studies of cancer and tuberculosis patients.

The wide range in the kinds of statistical analyses and in their application makes the statistician's work one of the most varied and stimulating in the field of public health. It requires imagination and vision to apply the right kind of analysis and to provide services that will really be useful. The statistician must be ready to make suggestions, to adapt new

techniques, and to recommend uses of the results in the improvement of the programs.

In the past, progress in health departments has often been measured by reductions in death rates from communicable diseases and in infant and maternal mortality. However, at present we have only an occasional death from typhoid fever or diphtheria, and deaths from puerperal causes are few. Certainly, we cannot measure the effect of a health department on a population by the reduction in deaths from communicable diseases. New ways of measuring the effect of specific programs on the health of the population are needed. We need morbidity studies to learn the causes of illness and disability in order to develop preventive programs.

All this means a constantly changing and interesting field for the statistician. In Tennessee, for example, our statistical work changes continually, and within a few months we may be involved in new applications that require new approaches. Examples from five fields of current interest will illustrate.

Birth Registration Test

The recent birth registration test made as part of the 1950 census is a good example of evaluation of statistical work and of the accuracy of birth statistics. However, the contribution of this vital statistics work will depend on use of the results in improvement of birth registration—particularly in States and localities.

For the test, the census enumerators obtained information on each infant born in January, February, and March 1950. These records were matched with birth certificates filed through routine registration procedures in all the State health departments except Massachusetts. Preliminary results released by the Public Health Service showed that 97.8 percent of the births in the United States were registered (*1*). However, there was considerable variation by States. In general, registration was not as complete in southern as in northern States.

All of us from States in which registration is not complete must further define the problem within our States. The percentages of births registered by counties in Tennessee are shown in figure 1. This information has been released in the health department's monthly bulletin, "The Spotlight," and thus each county registrar knows the problem in his county.

The breakdown of registration according to place and attendant in table 1 supplies further information on why births are not registered. While 99.5 percent of the infants delivered in hospitals were registered, only 91.9 percent of those attended by physicians but not delivered in hospitals and 84.8 percent delivered by midwives were registered.

Table 1. Number and percentage of births registered in Tennessee, by attendant, birth registration test, 1950 [1]

Attendant	Total births	Births matched	
		Number	Percent
Total	18,476	17,863	96.7
Physician, in hospital	13,206	13,146	99.5
Physician, not in hospital	3,471	3,191	91.9
Midwife, other, not stated	1,799	1,526	84.8

[1] Preliminary data from Public Health Service.

Analysis of results from the birth registration test has indicated where registration is incomplete and who fails to register. The next step is to plan and operate a better birth registration program. Many approaches must be used. First, the physicians delivering babies at home and the midwives who failed to register must be shown the value of birth registration so that all births they attend in the future will be reported. All registrars must be aware of the problem and of the ways of checking to insure that all known births are registered. The field agents of the division of vital statistics must aid in the counties where registration is incomplete. If the old tried ways fail, new methods of learning about babies delivered at home must be discovered.

Results indicate that the public does not know the value of birth registration. Therefore, a health education program is needed. A film entitled "A Piece of Paper," referring to the birth certificate, has been developed in Tennessee. This film will be shown to high school

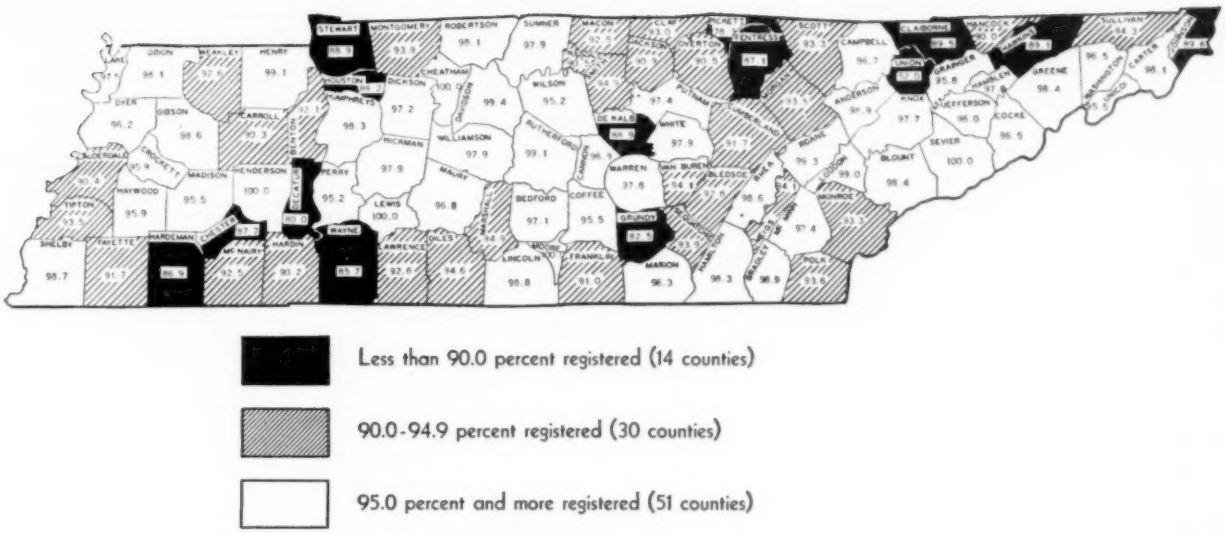
Less than 90.0 percent registered (14 counties)
90.0-94.9 percent registered (30 counties)
95.0 percent and more registered (51 counties)

Figure 1. Percentages of births registered by counties in Tennessee, according to preliminary figures supplied by the Public Health Service from the 1950 birth registration test.

students, to parent-teacher groups, at State and county fairs, and to other groups in hope that each prospective parent will know the value of the birth certificate and make sure that each infant is properly registered soon after birth. A pamphlet, "Birth Registration in Tennessee," is also in use in the education program.

Thus, the results of this birth registration test are being applied to planning and operating a program to improve birth registration.

Crippled Children's Service

In Tennessee, statistical assistance is given routinely to the crippled children's service for the administration of that program. A punch card is prepared for each crippled child placed on the register, giving name, date of birth, county, diagnosis, and similar data. A section shows the services and expenditures in a given year. These punch cards are used for preparing the annual reports and for making special tabulations whenever needed by the crippled children's service.

The annual report required by the Children's Bureau of the Federal Security Agency is completed by tabulations from cards of children treated by physicians during the year. In addition, we make tabulations for the director of the crippled children's service to use in evaluating the program. An example is table 2, which shows that 4,782 children (35 percent on the register) received physicians' services. The expenditures per child vary according to type of crippling condition. The expense per child for cleft palate and harelip was $93, for clubfoot $51, for rickets $21, and for burns $325. These figures are quoted when discussing expenditures with families and with county judges.

In addition to the program evaluation, analyses are made of specific problems and used in many different ways. One example is in the field of accident prevention. When the director of the crippled children's service discussed accident prevention at the Governor's Safety Conference, he stressed the prevention of crippling from accidents. More than 1,000 of the children on the register in 1951 (1,041, or 7.6 percent) had been crippled by accidents. Three hundred and seventy-four children had received severe burns. The expenditures per child were greater for treatment of burns ($325) than for any other type of crippling.

The number of crippled children on the register per 100,000 population has been studied by counties according to causes of crippling. These case rates are shown by counties for cleft palate and harelip (fig. 2). The higher rates for this condition and for rickets in east Tennessee counties are of special interest to the director of the program, and he hopes to find

the causes of the higher rates in order to develop a preventive program in conjunction with the treatment program.

Speech and Hearing Program

At the request of the director of the speech and hearing program recently established in Tennessee, statistical assistance was given in the design of records, and plans were developed for coding and punching data for children with serious defects. Since the director wished to evaluate case finding by several different methods, tabulations and analyses have been made according to method of case finding (*2*). Figure 3 shows the results of examination of all elementary school children through mass surveys, and of cases obtained through referral by teachers using symptom sheets and by teachers without preparation.

The mass survey revealed that 8.9 percent of the children had speech defects and 13.8 percent, hearing defects. The percentages were much smaller by the other two methods of case finding. By knowing how successful these various methods of case finding are, the director can decide how best to operate a satisfactory program. Analyses of the work by counties have also been useful in the operational phases. Many decisions have had to be made regarding defects. The need for consistency in order to develop satisfactory statistical data for analyses has meant review of records and procedures. In a new field such as this, the statistical phases are closely interwoven with the administrative, and continual analyses and

Table 2. Total expenditures and cost per child in each diagnostic group of children receiving physicians' services, crippled children's service, Tennessee, 1951

Diagnostic group	Number of cases	Expenditures	
		Total	Per child
Total	4,782	$275,518.04	$57.62
Tuberculosis of bones and joints	123	11,889.55	96.66
Poliomyelitis	1,366	[1] 23,494.28	[1] 17.20
Rickets	114	2,450.14	21.49
Cerebral palsy	451	38,183.20	84.66
Arthritis and rheumatism	77	15,073.71	195.76
Osteomyelitis and periostitis	109	10,562.41	96.90
Other diseases of bones and joints	639	22,312.30	34.92
Cleft palate and harelip	228	21,255.65	93.23
Clubfoot	411	20,971.87	51.03
Other congenital malformations	428	32,095.63	74.99
Birth injuries	93	2,185.05	23.50
Burns	106	34,468.43	325.17
Other accidents	212	20,697.66	97.63
Other	425	19,878.16	46.77

[1] Some expenditures paid by the National Foundation for Infantile Paralysis are not included.

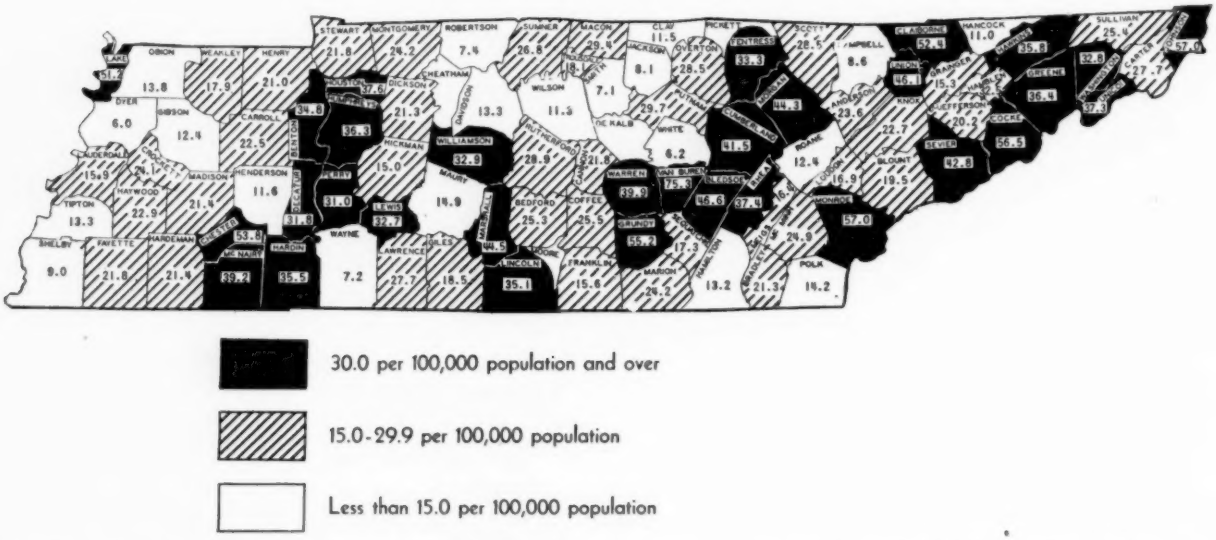

Figure 2. Number of children with cleft palate or harelip, or both, per 100,000 population on crippled children's register for Tennessee counties, January 1, 1952.

evaluation of results have a constructive influence on the program.

Statistics for Industrial Hygiene

The director of the Tennessee industrial hygiene program wished to know the health problems in industrial groups. Three types of data have been developed and used in that program: (*a*) mortality statistics by occupation and industry; (*b*) morbidity statistics through the study of absenteeism of workers; and (*c*) survey data.

Mortality by Occupation and Industry

Beginning with death certificates for 1944, the occupation and industry given for persons 15 years and over have been coded, using the classifications of the United States Bureau of the Census. The early work we did in this field pointed the way to the improvement and extension of such mortality studies. Many of the difficulties encountered were pointed out in a previous paper (*3*). Defective though the data were, differences were noted in tuberculosis death rates according to socioeconomic class. The rate for white men in professional work was 26.3 per 100,000 and for laborers 91.7. The National Office of Vital Statistics of the Public Health Service has contributed to the improvement of data on death certificates by release of the booklet, "Guide for Reporting Occupation and Industry on Death Certificates" (*4*).

Morbidity Statistics

As in all fields of health, morbidity statistics are preferable to mortality statistics for knowledge of health problems. In order to study the health problems of industrial workers, a study of illnesses of 1 day or longer causing absence from work has been carried on in Tennessee. Participating plants report absences to us monthly, giving data on age, sex, color, and cause of illness. Detailed annual reports, prepared for the plants, show frequency, disability, and severity rates according to age, sex, color, and causes of illness. By comparing the rates of a plant with rates of other participating plants and with those of a public utility, the health problems of the plant can be determined. Directors of industrial hygiene and of the statistical service can then discuss the problems with plant managers, and steps can be taken to improve the health program of the plant.

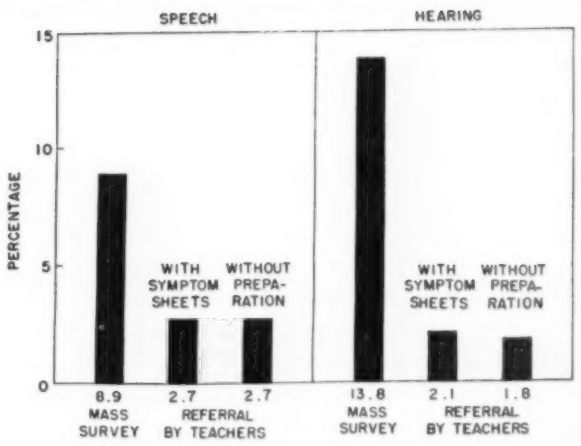

Figure 3. Percentage of elementary school children with speech and hearing defects, according to method of case finding in 19 counties of Tennessee, 1951–52.

Marked progress in the reduction of absences due to illness has occurred in participating plants. One plant has given permission for use of its data in discussing industrial absenteeism. The absence rates from illness and injury and from other causes in this plant during 8 years of participation are shown in figure 4. During the first few years of participation, the absence rates were high—especially for causes of absence other than illness and injury. More accurate data have since been obtained. The high absence rates are due to epidemics of influenza. The statistical analyses have been revealing and have been used continually in evaluating and operating the medical program of the plant.

Cancer Statistics

In order to obtain cancer statistics which would aid our program, a study of patients admitted to the cancer clinics in Tennessee is in progress. A summary sheet is prepared in the participating tumor clinics for each patient found to have a malignant neoplasm. The summary sheets are sent to the Tennessee Department of Public Health, where they are coded and punched and tabulations made for an annual report of the clinic. These annual reports give the clinic directors an evaluation of their

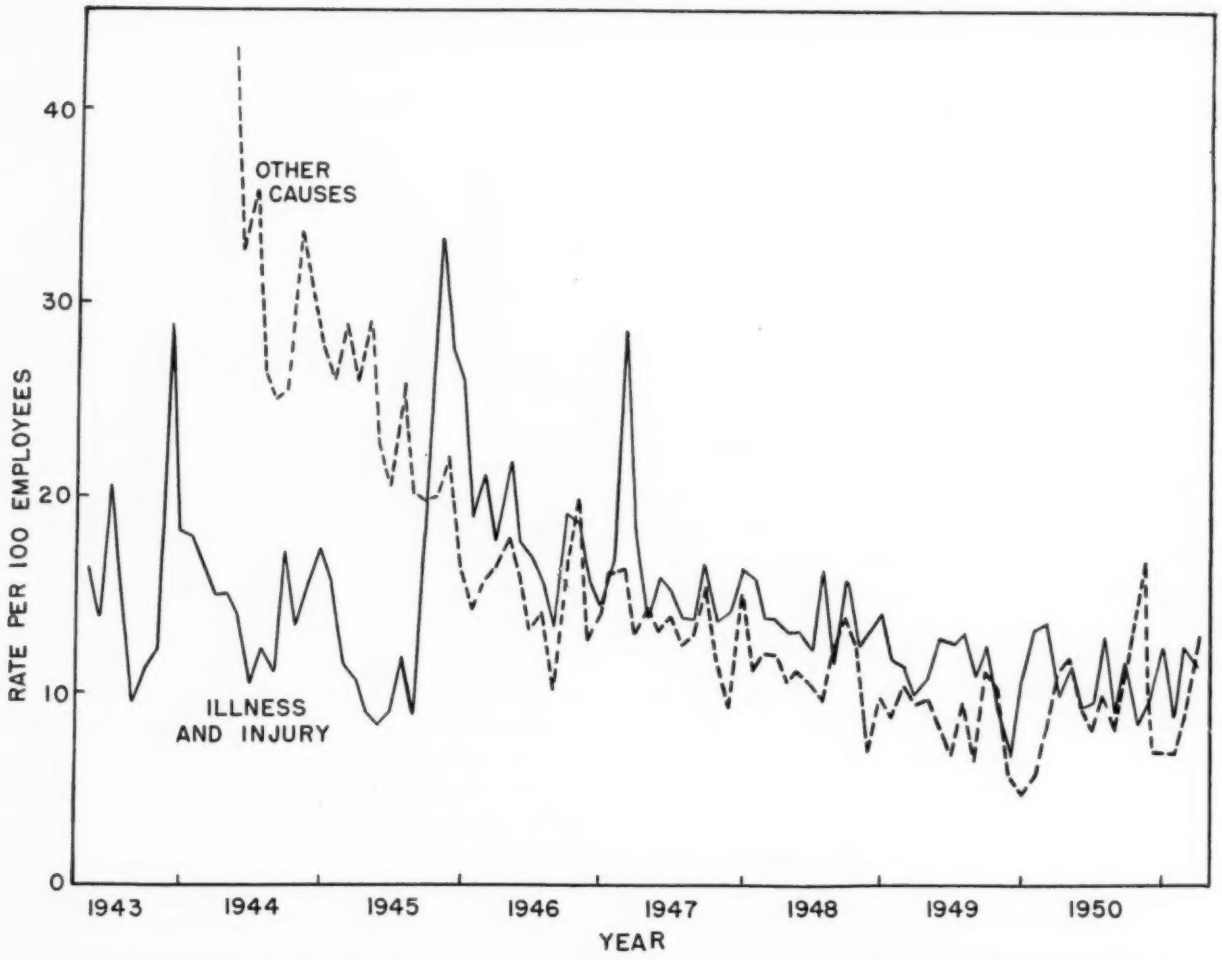

Figure 4. Absence rates per 100 employees from illness and injury, and from other causes, in a Tennessee plant, by months, May 1943 through April 1951.

programs through a careful analysis of the findings. They contain data regarding the number and distribution of cases by site, age, race, and sex, by extent of the lesion (localized, with regional involvement, or with remote metastasis), by period from onset of symptoms to diagnosis, and by type of treatment.

The data from all the clinics are combined annually into one report (*5*). Data taken from the 1950 annual report are given to show how the work is evaluated. The percentage distribution of cancer by site found in patients admitted to the Tennessee clinics in 1950 has been compared with the similar distribution of newly diagnosed cases found in Atlanta, Ga., through the survey (*6*) of the National Cancer Institute, Public Health Service (fig. 5). The Atlanta study recorded all cases of cancer found by physicians, hospitals, or by death certificates, which probably gives a good distribution of new cases in a southern community. Of the patients admitted to Tennessee clinics, 30.1 percent had cancer of the female genital organs, and 13.3 percent had cancer of the female breast (accessible sites). In Atlanta, the comparable percentages were lower, 16.3 and 10.3, while cancer cases of the digestive organs constituted 17.8 percent of the group. Thus in Tennessee clinics, cancer of the accessible sites is being discovered. Improvement has been noted, however, in detecting cancer of inaccessible sites, and more cancers of the digestive system and of the respiratory system are being diagnosed. The data show the need for health education and for finding cases in the localized stage. This material is being used by the cancer spe-

cialists, and one of the clinic directors uses the material in teaching medical students.

Each one of these cancer patients is being placed under observation, and his status is obtained at annual intervals from the date of diagnosis. An important part of this study program is to follow each patient and to analyze the results by calculating death and survival rates. Slips are sent to the clinics for the status of patients at annual intervals. If the clinic is unable to locate the patient, the slip is sent to the health department and a field visit is made. Careful follow-up of each patient is essential for analyses.

The method of analysis is the same as that used in the study of the life experience of tuberculosis patients (*7*). The probability of dying or of surviving is obtained for each year by an adaptation of life-table methods. By this method each patient is considered to be at risk of death for the year, except those for whom the status was unknown. Each of the persons of unknown status is counted as being exposed to one-half year of experience. The cumulative probability of dying during the period of observation is obtained.

Using this method, the probabilities of dying have been calculated for the different clinics by site, race, sex, and other distributions (*8*). Figure 6 shows the percentage of the patients diagnosed in 1947 as having malignant neoplasms of the skin, of the female genital organs and breast, and of other sites, who were dead at the end of the first 3 years of observation. During the first 3 years, 19.4 percent of the patients admitted in 1947 with malignant neoplasms of the skin died. The percentages were much larger for the other sites—60.6 percent of those with malignant neoplasms of the female genital organs and 54.8 percent of those with malignant neoplasms of the breast died during the first 3 years of observation. The percentage dying during the first 3 years of cancer of all other sites combined was 69.1.

As we obtain more data, analyses will be made according to site, extent of the lesion on diagnosis, type of treatment, and other variables. However, in order to have satisfactory data for analysis, it is advisable to build slowly and soundly. Procedures had to be established and follow-up has to be well done.

In the field of cancer statistics, the application of statistical analyses to the development and guidance of the program is especially important. The annual reports have been useful in showing the limitations of the Tennessee program and the need of service to patients with malignant neoplasms of inaccessible sites.

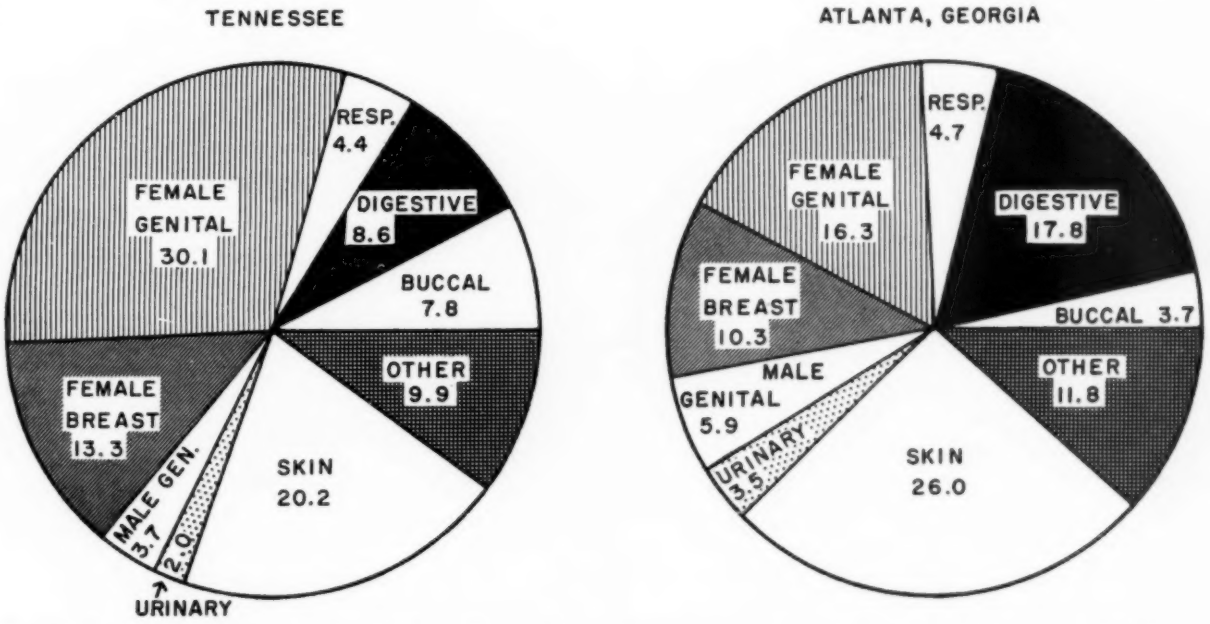

Figure 5. Percentage of cases of malignant neoplasms according to site for six tumor clinics in Tennessee, 1950, and for the Atlanta, Ga., area 1947.

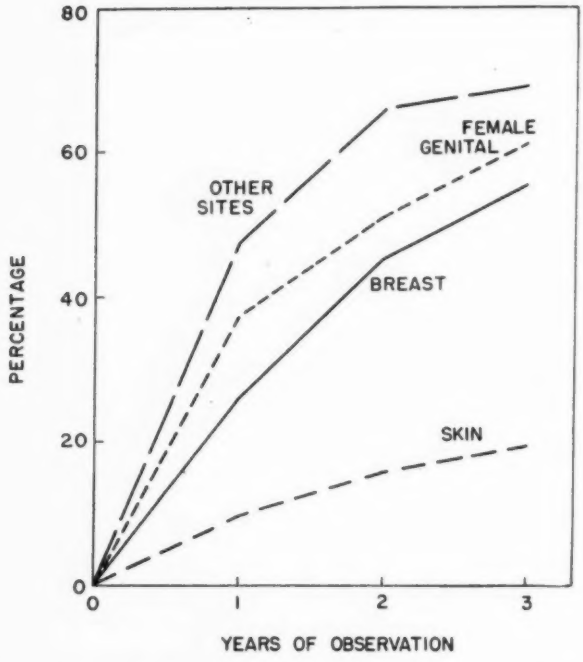

Figure 6. Mortality during 3 years of observation of patients with malignant neoplasms admitted in 1947 to five tumor clinics in Tennessee, by site.

Health education is also needed to get patients to clinics when lesions are localized. The analysis of the life experience provides a method of studying the treatment and behavior of malignant neoplasms of the different types and sites. Combining the experience of different cancer clinics with careful follow-up of patients through clinics and health departments will provide the medical profession, as well as health officials, with accurate data regarding survival of patients.

Summary

Several examples have been given of the application of statistical analyses to planning, operating, and evaluating different types of health services. Applications in five fields—birth registration, crippled children's service, speech and hearing program, industrial hygiene, and cancer statistics—show various ways statistical analyses serve in health programs. The statistical program is an integral part of all health programs for we need data for definition of problems and guidance of programs. Since the programs vary, each health department must decide how statistical analyses can be applied to specific problems. Because of the variety in the applications and the continually changing problems, statistical work provides an unusually challenging field of work.

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Current Methods of Collecting Statistics Of Health and Health Problems

By O. K. SAGEN, Ph.D.

The methods of collecting statistics relating to health and health problems are as multifarious as the subject of health itself. The extent and variety of health statistics are limited only by the resources available and the imaginations of those in this work. Although it is impossible to describe all statistical collection methods relating to health, an insight can be gained into what is going on and what may be done by classifying and outlining the principal sources of health statistics.

First, agreement is needed on what is meant by health and health statistics. The word "health" according to the dictionary means "state of being hale or sound in body, mind, or soul; especially freedom from physical disease or pain." The aim of public health efforts is to bring this salubrious state to the general population. The efficacy of the public health effort is evaluated by progress toward that goal. The role of public health statistics is to describe the current state of health, measure its improvement or deterioration, point out salient problems, and provide analytical material for evaluating and guiding the public health effort. Although this definition may seem excessively broad, it is necessary to adopt such a concept to encompass the field of the present-day public health effort and its associated statistical collection methods.

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This paper was presented before the Second Conference on Public Health Statistics of the School of Public Health of the University of Michigan at Ann Arbor, June 16.

Since the health of the individual is affected by his social and economic environment, public health statistics must include a considerable amount of information on the social and economic conditions of the people, as well as the biological aspects of their sickness and health. For this reason, the public health statistician needs to keep in close touch with, and have available, statistics on population, housing, employment, welfare, and related social conditions. These data are not collected and compiled by the public health statistician except as portions of social statistics draw upon data collected in health work, such as the vital statistics of birth, marriage, and death. The public health statistician has the responsibility of utilizing the statistics in these related fields by interpreting and applying them to health problems.

Methods of Collecting Data

There are three distinct ways in which data for health statistics originate: (*a*) statistics compiled from returns and reports required by law, principally those of birth, marriage, death, and reportable diseases; (*b*) statistics derived from program activities and operation of health facilities; and (*c*) survey statistics from which data are gathered purely for the sake of the resulting statistical information. Also, some collections of data may represent a loose combination of types, for example, mobile X-ray screening in a tuberculosis program wherein a survey for statistical data is combined with a case-finding device in the operation of an antituberculosis program.

Reporting by Law

Collection of statistics required by law has the advantage of legal authority to compel reporting, but it also has certain disadvantages for improving the administrative mechanism and changing the content of reporting. For example, the fact that the registration of births and deaths in many local areas is not in the hands of the health department is an administrative disadvantage. Even one State health department does not have birth and death registration responsibility. The disadvantage of legal specifications for statistical reporting is illustrated by the difficulty encountered with fetal death statistics. In order to extend the reporting to include all products of conception, it becomes necessary to amend the laws in almost every State.

In many instances, statistics originate in official licensure and regulation of various enterprises and occupations. The licensure of medical practitioners, nurses, and other health service occupations affords some statistical information on manpower resources in the field of health. However, more useful information arises from the licensure and regulatory activities over hospitals, nursing homes, diagnostic laboratories, and other institutions from which indications of illness can be obtained through required reporting. In the field of environmental health the licensure and regulatory function is the key to most of the information on the problems of environment. Notable examples are regulation of industrial health hazards; waste disposal; water, milk and food supplies; and housing sanitation. These services are often combined with a health service program, with the service aspect strengthened by the entree afforded by police power, while the law enforcement is facilitated by the persuasive aspects of useful service gratefully received.

Program Data

The proliferation of health services, facilities, and programs in recent years has given emphasis to the development of health statistics and to routine reporting of the statistical data. The administration of the services requires systematic record keeping which in turn generates statistical data. Compilation and analysis of these statistics become essential in administering, evaluating, and operating the projects, and here the official and nonofficial agencies share common problems. An example is the tuberculosis X-ray screening program in which the voluntary tuberculosis association conducts surveys side by side with the official health department. In this situation the statistics of the activity assume added importance because they provide the basis for coordinating twin efforts which cannot be allowed to clash or to duplicate and overlap each other. In other cases, the voluntary agency will operate the screening venture and the official agency will do the follow-up. Here again, the statistics provide an indispensable link in keeping the project in alinement and in balance.

The operation of health services—to people, to lower animals, or to environmental elements—brings out two competing demands for statistics. On one side is the need for statistics in the administrative work of planning and operating the projects, while on the other the so-called clinical or research statistics are needed to evaluate methodology and reveal new knowledge on the subject of the service. Since competent statistical work is expensive, the resources often are not sufficient to provide both kinds of statistics for the project, and a large amount of data arising out of health service operations is collected but not used, or is improperly handled. Another factor is the shortage of biometricians for work in the health sciences. Despite these limitations important statistical work is being done in the various health services, and utilization of the statistics is on the increase.

The phrase "health services" is used here to embrace the whole area of preventing, mitigating, and remedying disease, disability, and injury. Even this is not sufficient when we think of sources of health statistics obtainable from various insurance plans designed to mitigate economic loss to individuals due to sickness, disability, or death. Life insurance statistics for a long time furnished about the only source of consistent information covering illness and disability for a large part of the population. The experience of the hospitalization insurance and medical care plans has now been added to this source. In these activities, the gathering

of health statistics comes as an essential by-product of the operating records for the enterprise.

As stated earlier, the salient characteristic of the statistics from health services is that the statistical data are derived by a systematic handling and processing of the records used in operating the service. Good records are essential to efficient operation, as well as to reliable statistics. This becomes apparent the larger the service grows and the longer it operates. Health departments have encountered this fact in their experience with case registries for tuberculosis and cancer. However, we must keep in mind that there is a tendency toward overelaborate statistics from clinical data. A mass of unmanageable data results from trying to assemble every scrap of information. Clinical data are best utilized for specific research studies, with limited objectives carefully planned in advance of collecting the information.

The majority of health statistics arise from cross-sectional data on conditions as they exist at a particular time. Cross-section statistics fail to reveal what goes on in the never-ceasing process of change in people and in their conditions. Studies based on longitudinal data fill that gap by following the course of events in the same group of individuals through repeated observations over a period of time. Fruitful sources of longitudinal data are the health services given for chronic diseases such as cancer, for chronic or recurrent infections such as tuberculosis, venereal disease, and rheumatic fever, and for impairments such as those due to poliomyelitis, premature birth, and dental caries. Also, of equal if not of greater importance are longitudinal studies on persons who are apparently well at the outset. Compared to cross-sectional studies, longitudinal studies are costly if they are made only to complete follow-up. Indiscriminate enthusiasm for longitudinal studies has stimulated too many duplications of effort. For example, it should not be necessary to conduct identical follow-up studies in all cancer programs over the country, yet at one time this procedure was seriously advocated for cancer registries.

Emphasis is now given to obtaining statistical summaries of services provided by health departments, particularly in local health departments which want to know what each of their programs is doing. Many local health departments are keeping count of nurses' visits, of the number of children served by well-child conferences and in school health programs, the number of immunizations given, sanitary inspections and services rendered, and other activities of the local health department. Administrative data of this kind have appeal but are not as useful as they should be since the attempt has been to cover too much territory. The problem of how to use such data effectively in evaluating local health programs is undergoing investigation.

The mass of statistics that can arise from conducting health services and programs makes it important that health agencies exercise discrimination in planning statistical work. The primary necessity is to plan how much statistical work will be needed to operate the program effectively and to furnish a simple evaluation of its effectiveness. A decision is needed on what and how much research is to accompany the program and on what the potentialities are for learning something that is both significant and new. This is the joint responsibility of the program director and the health statistician.

Survey Statistics

The survey method of obtaining statistics is the oldest of the three approaches discussed here. In the United States the earliest comprehensive survey was the Federal census of population in 1790. The object of the survey method is to obtain cross-sectional information on the distribution of certain carefully defined characteristics in a population, which may be animate or inanimate, human, or any other species of fauna or flora. For a long time the survey method was restricted to a complete enumeration of the population under study. As a result of the development of statistical theory, we now have techniques for obtaining valid information characterizing an entire population by enumerating only a part of it. These statistical sampling methods are advantageous because of the relatively low cost at which reliable facts can be learned about a large population. The technique also furnishes information on the degree of precision which

can be safely attached to the statistical results. Extending the use of sampling surveys will open a veritable gold mine of knowledge on health conditions. So far, the most notable health study of this kind is the National Health Survey of 1935–36.

The various mass-screening techniques for tuberculosis, heart disease, diabetes, and syphilis; for dental, hearing, and eyesight defects; and for other diseases conducted individually or in combinations as "multiphasic" screening, provide challenging methods for making observations of large groups of the population. The principal object of screening has been case finding and health education so that early diagnosis can lead to early remedial treatment for as many as possible. Statistically, the value of findings in such surveys has not been as useful as desired because the screening applications have been only incidentally designed to yield statistics. If screening projects were conducted so that statistical sampling techniques could be applied, the data would yield information on distribution of the defects surveyed in the general population. Nevertheless, valuable data have been assembled through these screening processes.

It would be futile in anything short of a textbook even to list all applications of survey methods in health statistics. The Public Health Service has perhaps done more of this work than all other health agencies combined. Perusal of a file of *Public Health Reports* for recent years will provide a fairly comprehensive bibliography of the various situations to which survey techniques are being applied.

Quantity and Quality

The sources of statistics sketched are sufficiently comprehensive to indicate that there is no dearth of data on health as far as quantity is concerned. Current methods of collecting health statistics tend to emphasize quantity above quality. Part of this emphasis is due to the conditions which health statistics are called upon to describe and the large populations among which such conditions exist. An unfortunate circumstance is that statistics too often connote mere aggregates of numbers in tables in which one can search for and find an interesting numerical "fact." Throughout the country health statistics as a whole still suffer from much poor handling of data. Insufficient precautions in assembling data, improper processing, and unskilled analysis produce unusable and misleading "statistics." Year by year we are seeing improvement as the users of health statistics become better informed and as the statistical personnel in health work become more proficient.

State-Federal cooperation is doing much to improve the quality of State and national vital statistics. Current vital data are of a higher and more uniform quality throughout the entire country than ever before in history. The striking increase in the completeness of birth registration for the last decade bears witness to some of this improvement (*1*).

Health statisticians generally are getting sharper tools and learning how to use them. Great strides have been made in obtaining more uniform and precise methods of classifying original data, which is the first and most critical step in compiling statistics. The general adoption of good classification standards means that our health statistics all speak the same language. The greater use of mechanical equipment and the development of new machines expressly for processing statistical data have shortened the processing time, brought about greater numerical accuracy, and permitted statistical analyses which hitherto have involved too much labor.

The mechanical aids and improved compilation methods do not reduce the need for solid thinking in producing statistics. The object of the entire statistical process is to produce useful conclusions on health problems, conclusions that are valid and simply expressed. This represents an intellectual exercise that cannot be avoided. Current statistical practice applied to health data needs to give greater recognition to this principle if it is to utilize fully and properly the material already available in such abundance.

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Statistics in the Administration Of a State Health Department

By JOHN D. PORTERFIELD, M.D.

A recent issue of the *Harvard Business Review* contains an article on the relations between management and professional employees (*1*). The principal difficulty in these relations seems to stem, according to the author, from three facts: that management and professional employees rarely have the same objectives in view in pursuing their endeavors, that management and professional employees either do not speak the same language or speak different vernaculars of the same language, and that, because of the first two facts, there is considerable blocking in communications between the two.

My observations suggest that much the same factors form the basis of the problem in the use of statistics in public health. It is necessary to strike at the root of these difficulties and to devise methods by which the objectives of statisticians and public health administrators can be reconciled, their languages unified, and their communications made facile and two-directional.

It seems to me that State health departments provide, perhaps more than any other work center, an area in which understanding is too frequently absent and most vitally needed. In speaking for the health officer, may I recite his objectives, indicate his problems, and suggest how statisticians may help him with his solutions.

Dr. Porterfield, director of health of the Ohio Department of Health, presented this paper at the Second Conference on Public Health Statistics, School of Public Health of the University of Michigan, Ann Arbor, June 20.

Why a State Health Department?

Although 48 versions could perhaps be obtained on the reasons for the existence of a State health department, I offer my concept.

Standards

The first objective should be to determine standards of performance and achievement. In most instances, by State law, the State health department has the responsibility for establishing a minimum code or body of regulations which must be met by the local health units within the State however far beyond them their own inclinations and abilities may lead. Even where a minimum code is not a statutory requirement, the State health department is in the best position to develop and establish goals for the local health units of that State.

These standards may be as exact and measurable as the values of sensitivity and specificity requirements of an approved serologic laboratory or the number of days of isolation to be imposed upon a specific communicable disease. They may be as intangible—in our present knowledge—as the optimum time of a home nursing visit or the best ratio of public health personnel to population served. And they may be anything between. The State health department should have the time and the highly trained personnel to devote to investigation, to testing, and to determination of a set of values which can be used as a guide by local health units in meeting their community problems.

This activity of a State health department is not restricted to the formation of a State sanitary code containing the minimum require-

ments or standards of laboratory performance and communicable disease control. It includes the positive approach to a set of desirable values covering the whole range of local health unit operation—financing, staff, program content, methodology, and achievement. These desirable values may not always be set out as requirements, but they serve a useful purpose as bench marks.

Local Assistance

The second objective of a State health department, in my concept, is to assist local health units in meeting these standards. The methods of such assistance are legion and include such things as guidance, consultation, the exchange of information, the provision of highly specialized or expensive personnel and facilities for periodic or continued cooperative use of local health units, financial assistance in the way of supplementation of local budgets with either State or Federal grants-in-aid, and finally, and least exploited to date, the objective analysis of the current performance and achievement of local health units in comparison with State averages and with the standards developed by the State department.

Direct Service

The third objective I put last intentionally. The department must perform those direct health services for the population of its State dictated by the statutory charges made by the State legislature. While there is wide variation from State to State in these assignments, it is becoming more capably demonstrated every year that direct services of a State health department should be confined to the type of work that can be done more effectively on a state-wide than on a community basis.

There probably are not too many of these services. One example of the type of program which is not too susceptible to delegation as a local health unit responsibility is water pollution control. This work must generally be done in terms of drainage areas since streams and rivers have given little thought in their meanderings to the local jurisdictional lines that may be crossed. Control of surface water pollution is not quite as closely distributed in population profiles as is, let us say, communicable disease control. There may be other and perhaps even more appropriate instances of direct health services which can be better performed by State health departments than by local health units. But their number is limited.

Use of Statistics

If these, then, are the reasons for the existence of a State health department, how can statistics be used in meeting these objectives? It seems apparent that the first objective, the determination of standards, must depend heavily upon the use of statistical tools and the proper treatment of the proper data to arrive at satisfactory conclusions and recommendations. Scientific research in the sense of establishing new knowledge in the scientific field is probably not a primary function of a State health department, although there are some that indulge in this activity to a greater or lesser extent. Applied research certainly is necessary, and the most neglected field of applied research is in administration methods. Granting that a program director knows intimately the scientific details of the field wherein he works, there is still considerable room for investigation into methods by which scientific knowledge can be used to help the population aggregates which have the problems.

Obviously, it is necessary at the very beginning to measure the extent and distribution of the public health problems. Just as obviously, the trial and error method of developing satisfactory solutions to these problems is expensive and time consuming. Knutson in *Public Health Reports* has presented articles on the pre-evaluation of proposed health education programs (*2, 3*). This is a type of study which cries for extension to the other special areas of public health.

An indispensable feature of investigations leading to recommended standards is the development of reasonably precise methods of measurement which can be applied to the observations made. The venereal disease control officer may know that the epidemiological work of contact tracing and examination is as important as the treatment of diagnosed cases of infectious syphilis. But to develop a standard for performance of this phase of the program,

he must join his knowledge of the epidemiological ramifications of syphilis with the statistician's ability to plan for accumulation of valid and uniform data if he is to be able finally to recommend that at least one contact be found and examined for every case diagnosed. Note that this standard is not purely the outgrowth of his epidemiological knowledge but is tempered by the findings of the statistician as to what common experience and achievement are.

In any development of standards, it is necessary that a continuing process of comparison of the current standards with results achieved must be maintained so that the standards are not alone ideal, but are also practical and attainable. This process cannot be accomplished without the initial development of means of data collection and result measurements. And, finally, under this heading, it is a necessary but too often forgotten requirement that continuing data collections after the original establishment of standards be at the minimum essential for proper control and should never be above the minimum purely for data collection. Only a statistician and a program chief in complete cooperation can make those determinations.

Problem Measurement

That brings us, of course, to the second objective—the assistance of local health units in meeting the established standards. Here we must have careful and current problem measurement—not only natality and mortality, but also the causes of mortality and the measurement of morbidity. We must have effective means of comparing performance with the standards, remembering that not only performance, but also the standards themselves can change. And we must have some measurement of the effectiveness of methods used in our programs. Examples in practice are the percentage of yield in case-finding programs and the comparison of cases reported with deaths reported from specific cause.

A State health department has or should have a considerable body of consultants—who spend their time consulting. Now a consultant's visit is always valuable to a local health unit if he is able to bring the news, the trials and errors and solutions of other units with similar problems. The visit is valuable if the consultant has the proper and adequate amount of training, experience, and ability to communicate so that his fund of knowledge is useful to the local personnel. The visit is twice as valuable if the suggestions and recommendations are framed to the specific problems, needs, and resources of the unit visited. And this double value can be provided if the consultant has had the opportunity before the visit to review the proper data collected from the unit and the analyses and interpretations which have been made of the data.

One of the most effective means of drawing a local health officer's attention to the needs of his tuberculosis control program is to show him the ratio of cases found to cases first reported by death certificate. We have found it to be impressive when we can show a local health officer not only his area's infant death rate compared to the other areas of the State, but also the distribution of deaths by age during the first year of life. It helps him to determine whether further reduction of the rate requires emphasis on improved obstetric care, hospital nursery care, or home care. It makes a big difference whether his logical move shall be to stimulate physician education or to increase his postnatal visits and emphasize his home sanitation program.

Should the State lend its much demanded and expensive mobile X-ray unit and team for 2 weeks to a completely rural county whose tuberculosis case and death rate has been the lowest in the State for years? If instead the time is allotted to an urban area with higher rates, will the value of the loan be enhanced by arranging for the unit to concentrate on those census tracts containing the lowest economic groups with crowded substandard housing even though the percentage of population screened is less than it would be if the service were directed to the well-regimented children of a cooperative school system? These questions can be answered when the proper data have been collected and properly analyzed.

In most public health programs we have passed the shotgun stage where we can do an unmeasured but vast amount of good by firing blindly out of any window. We are now in the marksman rifle stage. Particularly with our

straitened budgets in these high-cost days and with our almost permanent limitation of trained personnel, we must make every shot count. As we approach our solutions of public health problems, our target becomes ever a more closely defined one. And statistical analysis is, to continue the metaphor, our rifle sights.

Fiscal and Administrative Data

During the last several years Ohio has attempted to develop a basic formula to be used in the distribution of Federal grants-in-aid reallocated to qualified local health units. It was felt necessary that such distribution should be as objective as possible and should be guided only by pertinent factors such as population, financial need, public health problems. Such a formula has been devised and is being used, and, while the change to this system has caused difficulties, the ultimate system promises to be good. The important point is that the administrative people found themselves depending heavily upon the statistical people for this formula development. An even more important point is that the statistical people have discovered a rich field of inquiry in the governmental financial structure. This is not as far removed from the field of public health as it would seem, and it is certainly an area of keenest interest to the local health personnel.

While we may hope some day our investigations will suggest some sound answers to Ohio's budget questions, we have already foreseen another question begging solution—how to measure the effect, both psychological and programwise, of Federal assistance. Foundations have for years pondered this question. I am not sure their tentative findings will be ours.

Statistics in Direct Services

Statistics aid the direct services of State health departments in the same way they do the local departments. In justifying a new program, the problem must be measured in size, in distribution, and in internal structure. The new program should be pre-evaluated, and the running controls of performance and achievement must be established with preparation of the most efficient data collection and analysis mechanisms. Existing programs should periodically rejustify their existence and test the effectiveness of their methods. In Ohio, we have just finished reviewing the results of a small program on high nitrite concentrations in private water supplies. The percentage of private supplies showing significant concentration was too low to warrant the continuation of routine chemical laboratory tests. Related data showed little evidence of human effects and suggested that the judgment of the sanitarian in the field as to the circumstances surrounding the private supply was a better guide than laboratory tests and entailed no extra costs. We have stopped, therefore, doing routine nitrite tests on water samples from private supplies.

While statistical services to local units may be considered in great part educational, a direct service of the statistical unit to its own department is as a more formal educational resource. The close union of the State health department and the department of preventive medicine of the State medical school, where circumstances permit such alliance, is mutually beneficial. A respectful appreciation of quantitative medicine implanted in the minds and hearts of medical students will produce a healthy skepticism in the youthful reader of professional literature. It will in time improve the quality of such literature, and, not least, it will encourage understanding of community medicine, of disease reporting, and of kindred matters in a future ally—perhaps even a future colleague in the specialty.

Vital Statistics

The final role of statistics to be mentioned here is the traditional statutory one of the State registrar. There must be collected and preserved appropriate records of births, stillbirths, deaths, adoptions, legitimations, marriages, and divorces. In this connection, there must be close supervision of the functions of local registrars. The State registrar has gone far in perfecting his duties and his methodology. What remains in many places is the activation of his mine of information for more than the regular annual report. Many, if not most, of the program chiefs of the department will find

much in the registrar's data of concern to them in program planning.

The Biometrics Unit

The statistical or biometrics unit must naturally be under the direction of an experienced biometrician. We have had accomplished statisticians from other fields who find too much difficulty in understanding the problems and needs of the program chiefs. The biometrician must be capable with statistical tools, must have a reasonable understanding of the content and modus operandi of public health programs, and must have a sufficiently fluid imagination to develop means of applying his techniques to the subject.

The unit must have sufficient numbers of statistical clerks to handle the daily load of routine work. Some say this should be a mobile work force capable of assignment to whatever job is in present demand. Others point out the advantages of specialized statisticians or clerks within the unit, assigned more permanently to the work of particular programs. There is something to be said for both sides, and that decision is yet to be reached. The unit should, if possible, have a graphic artist, one who can translate into understandable visual aids the technical charts and tables.

Somewhere in the department there will be a machine-tabulating force, and almost always there will also be a clerical record-keeping unit to handle what the machines do not. Both of these facilities, if not in the biometrics unit, should be so closely associated as to avoid any gaps, either physical or mental.

The location of the biometrics unit in the State health department is a topic I approach with some hesitation. I do not know the answer. Some day I hope to. Certain principles must guide us, but the decision in any State depends ultimately not only on adherence to these principles, but also on the personalities involved and their relative abilities.

The principles are these: that the only purpose of organizational structure is to facilitate function and that the intradepartmental relations must therefore be based on services given and obtained between various units in the structure. In Ohio, we have occasionally followed this practice: When the major portion of services goes to one major division of the department, the service unit is placed in that division and from there provides its lesser services to other divisions; when services are distributed fairly evenly to a number of major divisions, the service unit is located in the administrative center of the department, whether it be called the division of administration, the bureau of central services, or what.

Certainly, program chiefs and the biometrics chief should have direct access to each other. The only intervening factor may sometimes be a referee, one who can settle questions of priority and service distribution, particularly where resources are limited. The biometrics chief deals with each program chief, with the office of local health services in the correlation of services to local health units, and with the office that devotes its attention to research and to standards development.

In serving local health units, while biometrics goes through the office of local health services, it should go all the way through and actually visit local health units. It will do both sides good in understanding their common objectives. Occasionally, personnel of the biometrics unit may be the specialized personnel mentioned before who may be placed on temporary assignment to a local health unit to help in the establishment of a new record system or for other special problems.

The biometrics unit should have a fair degree of autonomy to pursue all these aims. But through the medium of staff meetings or planning conferences, it should be kept in close relation to the body of which it is a part. It will have outside relations, on the one hand with local health units, and on the other with the National Office of Vital Statistics and the epidemic intelligence group of the Public Health Service. With these latter Federal agencies, the unit will develop and maintain its functions in collecting and forwarding its share of national data for analysis and will in return look to these resources for consultation and assistance in special studies and problems.

As health officers and statisticians work

closely together, the similarity of their objectives will become more and more apparent. As we continue to confer, we will learn each other's idiom and our communications will be perfected. Out of the potpourri of disparate training we will get in public health a new generation with broad understandings and widened abilities.

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Vocational Rehabilitation

Successful employment last year for 2,600 rehabilitated young civilian men and women with heart disease set a new record, the Office of Vocational Rehabilitation of the Federal Security Agency recently announced. The previous record was 2,300.

The average age of the worker in the group of 2,600 was 17 years when the disability became evident and 26 years when vocational rehabilitation was started.

At the beginning of the rehabilitation, 2,316, or 89 percent, of these men and women were unemployed. Forty-six were working on farms or helping with family work. Wage earners in jobs dangerous to their health numbered 288. The average wage of the working group was $1,577. After vocational rehabilitation, 2,427, or 94 percent, were earning a yearly average of $2,133. The remaining 158 were doing farm or family work for which no record of earning was available.

A new record was also set in rehabilitating into productive employment 5,696 men and women with hearing disabilities. About 1,500 of these persons were deaf, and 4,200 were hard of hearing.

Of particular significance in the rehabilitation program for the deaf was the extreme youth of the group, indicating that the State rehabilitation agencies are reaching many young people of school age and getting them ready for work before they run into job-finding difficulties that usually beset people who cannot hear. The average age of this group, 90 percent of whom were out of work when help was started, was 25.

Three out of five of the hard of hearing were out of work, and practically all the others were in danger of losing their jobs or were in unsuitable work. Their average age was 39.

As a group, the rehabilitants with hearing difficulties increased their earnings from about $2.3 million a year to more than $10 million the first year, an increase of 344 percent.

The Administrative Value of Statistics To a Local Health Officer

By BERWYN F. MATTISON, M.D., M.P.H.

In medical school teaching, at least, biostatistics is usually associated with the school's department of public health and preventive medicine. One might almost say that statistics is "blamed on" the public health physician. And yet, with a few outstanding exceptions, little really useful information has been available to show health officers the quantitative relationships between morbidity, mortality, population characteristics, and public health services.

Kinds of material available include: crude birth and death rates; specific mortality rates for a few communicable diseases; reported case rates for a few diseases; and from some State offices of vital statistics, annual figures on population characteristics (usually from the most recent Federal census)—age, race, sex, and occasionally marital status—on rather broad geographic area breaks.

Also, most public health administrators have provided themselves with total health service figures for: public health nursing visits; type of care supplied—tuberculosis, infant, antepartum, bedside care, or general health supervision; and similar figures for sanitation personnel activities in terms of total inspections by type of establishment.

Unfortunately, the cross relationship of health services to population served, or associations of differing population patterns with differing specific mortality or case rates were usually missing. Nor were the sanitation inspection figures usually related to the total need in terms of the number of institutions of the various types inspected and results attained in securing abatement of violations for any particular inspection unit.

Perhaps I am unduly skeptical, but I have found that local health officers initiate very few new health programs. Health programs are usually either inherited—witness those in tuberculosis, child health, venereal diseases, communicable diseases, sanitation, and public health nursing—or are thrust upon the health officer by some higher authority. Civil defense, cerebral palsy, and municipal water fluoridation are typical programs.

This does not mean that original contributions in administrative public health cannot or should not be made from the field. It does imply, however, that most of the original contributions made by local health departments are in terms of changing service programs through a continuing evaluation of their effectiveness. In a local area, this results in shifting emphasis from one part of a public health program to another, rather than in a summary abolition of old programs or initiation of new ones. Hence, the vital necessity for consciousness of quanti-

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tative factors in both program control and evaluation.

Local Area Statistics

There are several ways in which vital statistics and health indexes can be used to improve program control. For instance, mortality figures can be brought down to a local area, even in a large city. In Buffalo, N. Y., the only figures originally available were the State mortality rates for the entire city. The health administrator needs more information than that. He can use rate groupings by census tract or by ward units to point up the problems of control, since they vary as much within the city as they vary from county to county, or from State to State.

Mortality data by local area and similar information about reported morbidity and current population patterns—age, sex, race, economic status, crowding, family size, marital status—serve as a firm basis for shifting sanitation and nursing personnel where they are most needed. The map of Buffalo shows the relationship of the child population, as determined by birth rates for census tracts, to the frequency and distribution of well-child clinics. Only by combinations of such information can our limited facilities and services be utilized to their maximum advantage.

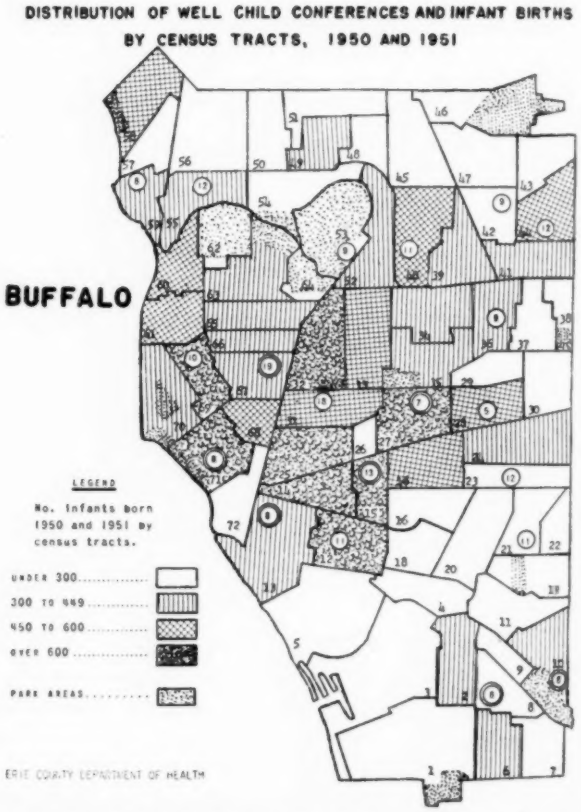
Nor is it sufficient to have only the geographic distribution of morbidity and mortality facts. They must also be put in their proper relationship to chronology. These patterns vary too and certainly must be anticipated by the health officer in allocating vacations and other shifts of personnel service within each calendar year.

Program Planning

Sometimes a little advance planning, together with a consciousness of the requirements of certain basic data in the analysis of any health problem, converts the routine procedure into a most valuable fact-finding operation.

Smallpox Epidemic

A few years ago, a small but sharp outbreak of smallpox occurred in New York City. Both within the city and in its suburban areas, a large number of vaccinations and revaccinations were performed in order to block the further spread of the disease. In one community nearby, the health department performed approximately 30,000 immunizations. This meant somewhat frenzied activity on the part of the small department for a few days. However, plans were made for the return of approximately 10,000 vaccinated persons for reading and interpretation of their vaccination reactions. Also, schedules were prepared for completion at the time of their return. The schedules provided information on age, sex (race was omitted as unimportant), date of last vaccination, if any, and other relevant facts. Thus, after the smoke had cleared away, the results of revaccinations on more than 8,000 individuals, when tabulated, provided informa-


DISTRIBUTION OF WELL CHILD CONFERENCES AND INFANT BIRTHS BY CENSUS TRACTS, 1950 AND 1951
BUFFALO
LEGEND
No. infants born 1950 and 1951 by census tracts.
UNDER 300
300 TO 449
450 TO 600
OVER 600
PARK AREAS
ERIE COUNTY DEPARTMENT OF HEALTH

A desirable use of local statistical data is illustrated in the above map prepared by the Erie County (N. Y.) Health Department. Similarly, a handbook of maps for Buffalo and Erie County (by census tracts, by wards, or by townships) shows mortality data by cause of death and other statistical data as well.

tion about the duration of immunity, at least insofar as it could be measured by the vaccination reaction, that was unknown before.

Poliomyelitis Season

Another use of existing records as well as special study records may be mentioned in connection with the policy of banning immunizations during the poliomyelitis season in New York State last year.

From a field study, it was found that children over 6 months who had received immunizing injections in a period preceding a poliomyelitis outbreak had definitely higher attack rates of the disease than children not so injected. On this basis, it was recommended that no immunizations be given to children of that age during the summer months.

Little attention was paid to the fact that the absolute number of cases of poliomyelitis occurring during the second half of the first year of life was extremely small.

In Erie County, N. Y., we were concerned about the possible effect of this policy on our diphtheria control program. So we inquired further: first, so far as poliomyelitis was concerned, how many children could have been affected by this change in immunizing procedure if the new policy had been in effect during the preceding two epidemics in this area; second, how much loss of actual immunizations against diphtheria was associated with the new policy.

By checking poliomyelitis reports for the two preceding epidemics, we found that only 11 out of 500 cases (or about 2 percent) had occurred during the first year of life. Thus, if as many as 50 percent of the cases in that age group contracted poliomyelitis because of the former policy of immunizing through the summer months, then not more than 1 in 100 cases could have been affected by eliminating the immunizations.

Diphtheria Immunizations

Following the poliomyelitis season in 1951, we kept close check on attendance at our immunization clinics and well-child conferences during the remainder of the fall and early winter. A review of these records for a district of more than 110,000 people indicated that not only was there no compensatory increase in attendance at either type of clinic following the season, but that the total figures lagged noticeably behind those of the preceding year. Actually, instead of the 413 diphtheria immunizations given at the clinics in 1950 between July 1 and October 14, only 81 were given during the same period in 1951. According to our 1951 policy, all were children under 6 months. A total of 332 children past that age failed to receive protection during 1951 who might have been so protected if the 1950 immunization rate had prevailed in 1951. When we considered the failure of the compensatory increase during the fall months, there was found to be an over-all decline of 58 percent in total immunizations given in our clinics for that district during the interval from July 1 to November 30, 1951, as compared to the same period in 1950.

Because of these considerations, we have liberalized our current policy for completing immunizations of infants under 1 year of age. Season will be disregarded—at least in the absence of a definite epidemic of poliomyelitis.

Program Control and Evaluation

Apart from vital statistics and health indexes, another group of records which form the basis of quantitative program control and evaluation is the health service records in a local department of health.

Nursing Records

For many years, we have used the State public health nursing service records. These are based on daily and weekly service records and are hand-tabulated by each nurse every month. This was time-consuming. Two years ago, we changed over to a "mark-sense" card for reporting each nurse's daily activities. No hand tabulations of these cards are necessary; they are turned in at the end of each month for machine-sorting. The greater flexibility of this system is obvious. It eliminates the clerical time formerly required of each nurse. It also makes possible rapid and accurate monthly analyses of activities in each subdistrict, and periodically, for supervisory purposes, a detailed analysis of each nurse's case load. Best of all, it makes possible the occasional spot-checking of

different activities not ordinarily recorded in detail.

In each of these special analyses we obtained more data about our nursing services and about the individuals served. Some of the special sorts made during the past year include an individual case count and a count of individual families receiving nursing service; accident information in homes visited; details of arthritis case visits; and nursing and physical therapy services given to cerebral hemorrhage patients.

It should be noted that all public health nursing service records, as well as all sanitary inspectors' service records, are kept according to census tracts so that services can be related to population and environment.

Sanitation Records

Until the past year, sanitary inspection records were chiefly listings of visits without any particular relation to the total size of the problem. Our figures now, however, show the number of places by type (hotel, boarding house, etc.), as well as the number inspected each month. Provisions are made for measuring, to some extent, the effectiveness of each service. To do this, we changed from weekly service records, which were hand-tabulated at the end of each month, to a daily time sheet indicating type of establishment, type of activity, and the time involved, together with a mechanical punch card prepared in the biostatistics office to which material is transferred directly from the daily time records after coding by that office. Here again, a great deal of clerical time is saved, and a much closer relationship can be established between type of service given and the total problem in each area.

Value of Records

Another example of the value of complete and usable service figures can be mentioned. In one district, shortly after the establishment of our relatively new county-city health department, the "undue amount of time spent in conference" was locally criticized. It was true that members of the public health nursing service, formerly without adequate supervision, required intensive in-service training at first. This meant many conferences and some additional travel time in bringing the staff to the central office for training. However, analysis of the records showed that the increased conference time paralleled an increased utilization of field service time, which was indicated by the number of nurse visits per 100 hours of duty. This point was immediately accepted, and criticism ceased.

One of the unmet needs of administrative program control and evaluation is the further development of ways for relating the efficiency of services to changes in health indexes. In spite of all of our vital statistics and service record figures, little has actually been done to relate the two.

Program Indexes

One outstanding exception, in New York State, is the venereal disease control program. It has developed program indexes which are most useful. We have the number of cases of early syphilis reported each year and the proportion known to be under treatment. We have the number of new cases of early syphilis interviewed for contacts and the number of contacts named. We know the number of previously unreported cases of syphilis discovered among the contacts named. We also know the proportion of reported cases under treatment that have been observed for at least a 12-month period after treatment. Many of these indexes give fairly simple checks on the effectiveness of field procedures in use from day to day.

Unfortunately, indexes for other programs are not so well developed as in venereal disease control. In tuberculosis control, we know the number and classification of reported cases and the mortality rate by age, race, and area of residence. But there are many relevant factors and associations which are not usually available.

Tuberculin surveys to determine infection rates in different age groups are sporadic rather than routine in most communities. In Erie County, N. Y., we spot check elementary and high schools to determine the rapidity with which children in those age groups are becoming infected, but we have little information about the pattern of infection either in the preschool group or in the age groups beyond

high school. We assume that factors like crowding and other housing conditions are intimately associated with the spread of and mortality from tuberculosis. And yet, with the exception of mortality and case-report rates by census tract, little of this relationship can be clearly quantitated.

An attempt is under way in Buffalo to get basic nutrition data by surveying selected school-population groups for early stigmata of nutritional deficiencies. That information, when it is complete, may possibly be related to the factors of crowding, annual income, family size, and tuberculinization to give us a better idea of the mechanics of tuberculosis spread.

Of course, it is now possible, with the final information available from the 1950 Federal census, to show the relationship between some of those social factors and the occurrence of various chronic diseases. Much more needs to be done. For instance, in Erie County we are attempting to describe quantitatively the fate of minimal cases of tuberculosis picked up asymptomatically by survey methods and to compare them with the fate of minimals picked up in our clinics after they have sought care because of symptoms. Basic physiological differences such as this in the host-parasite relationship cannot be lost sight of in making administrative decisions as to the effectiveness of special programs.

Health Patterns

The shifting age pattern of poliomyelitis epidemics is well established. The relationship of that change in age pattern to sanitation, housing, crowding, and similar social factors is less well understood. Similarly, we are only beginning to be conscious of the real significance of delaying infection from poliomyelitis and other communicable diseases until they affect groups having higher mortality and more crippling defects. It is easy to shut our eyes to the fact that our efforts in sanitation, let us say, may be actually neutralizing our efforts in communicable disease control, if we think in terms of resultant mortality and crippling. Yet these associations can be quantitated too.

During the past 15 years, there has been a marked drop in the maternal mortality rate in New York State. Recent analyses show that two plunges in a downward trend occurred in 1936 and 1946. The first has been attributed quite properly to the introduction of sulfa drugs and to a sharp decrease in the component deaths from puerperal infection. The second interruption has been attributed by some to the more widespread use of antibiotics and blood or blood substitutes. But let us go beyond the patients to the population.

Since World War II there has been a sustained increase in the birth rate; a lower age at first marriage; a lower age at first childbirth; and a disproportionate increase in the average number of children born to better educated and higher economic groups. All of these factors would tend to decrease the maternal mortality rate as they would bring more and more births into experience groups which we know to be associated with more favorable rates. Without detracting from the importance of the antibiotics and the greater availability of blood transfusions, I submit that we must always consider the denominator as well as the numerator of our changing health indexes.

Program Promotion

Another administrative use of statistics by the local health officer beyond planning, control, and evaluation is program selling or promotion. To the local health administrator, it is useless to know what programs are desirable for his community or how effective they can be unless he can persuade the community of the need for such programs and get financial support.

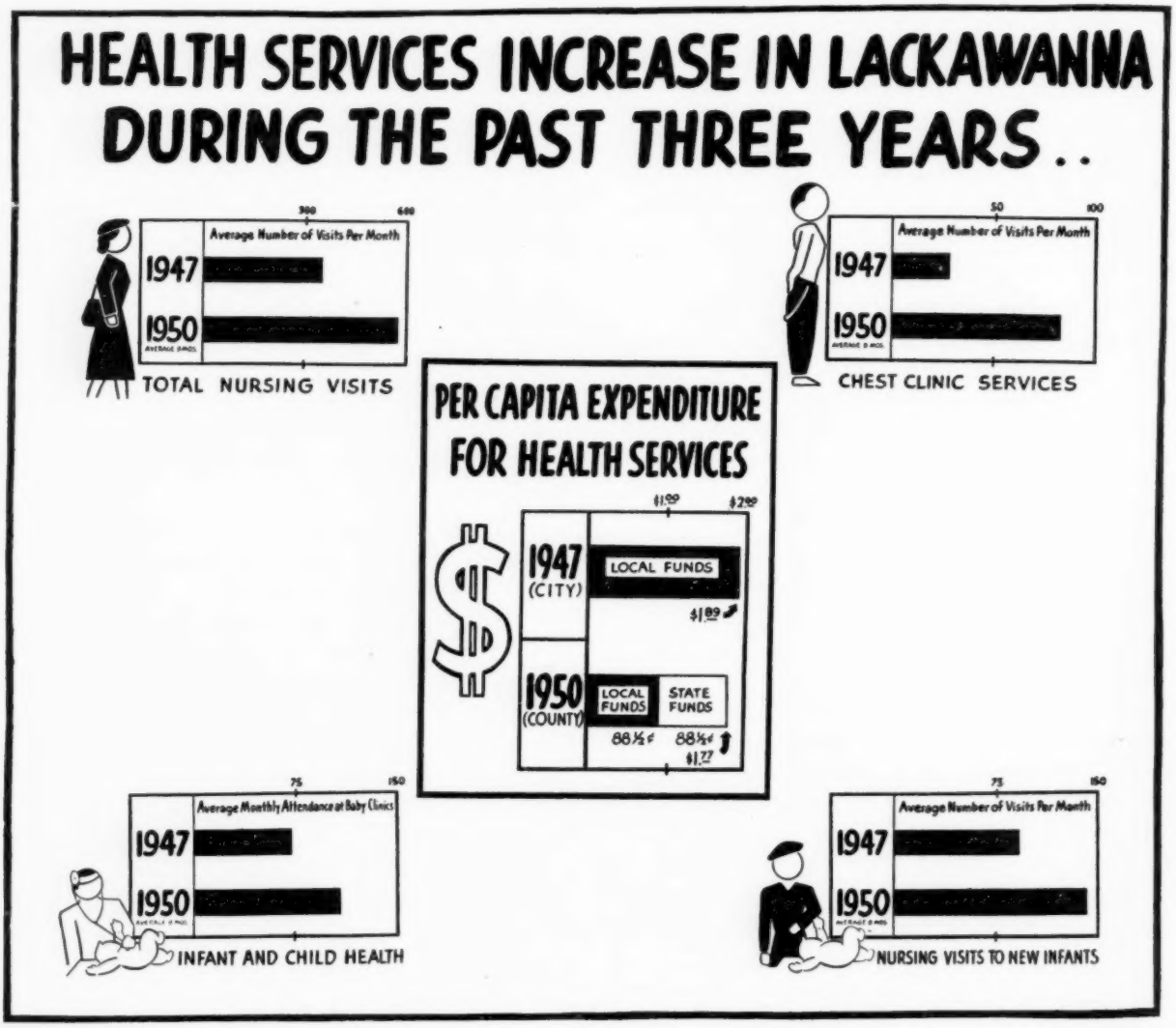
Statistics can play an important role in this phase of our responsibility. First, refer to the chart which illustrates the services available to one district (Lackawanna) within Erie County before and after the institution of the county-city unit there. By simple bar diagrams, the comparison of services and costs was brought home so forcefully that this one chart alone played a definite role in quieting criticism and obtaining acceptance of the new organization in that particular area.

Meeting Criticism

Another example of program selling is the approach to answering criticism of our crippled children's program. The State medical rehabil-

itation program system for approval of qualified specialists giving services to crippled children was thought to be unduly restrictive. A few physicians in the community were doing most of the work for county and State programs, it was said. An analysis of our records demonstrated that the criticism was without foundation. The services provided by 46 physicians cost from $237 to $915 a case, according to type of service. Findings of the children's court showed that less than 10 percent of the parents were able to pay part or all of the costs of special surgery.

The value of surveys should also be mentioned. A recent survey of approximately 1,100 Erie County physicians by the Western New York Committee for Education on Alcoholism revealed that a great preponderance of the responding Erie County physicians believe the educational program of the committee, during the past 3 years of operation, brought more chronic alcoholics under medical care. The survey also indicated a real recognition on the part of the practicing physicians of the need for further education on alcoholism. Eighty-eight percent of the respondents said the need is important, and gave the committee a convincing argument for local community



Display of the above chart picturing comparative costs for selected health services in Lackawanna, N. Y., contributed successfully to the acceptance of a new city-county health department in Erie County, N. Y.

chest support. This kind of argument is obviously more telling when backed up by the quantitative opinion expressed in a survey than when it is merely the subjective opinion of a few individuals.

Appraising Exhibits

The health exhibits appraisal made by our office of health education at the county fair has been most useful to us. Devised as a method for improving exhibit materials at the fair, the appraisal consisted of a time study, a professional evaluation, and a visitor preference poll. The microblood diabetes detection booth was by far the most popular service program with individuals going through the fair's health building. Here again, as in the alcoholism survey, quantitative information covering hundreds of visitors polled was more impressive when brought to the attention of sponsoring agencies than any number of theoretical considerations. Again, the continued financial support of the diabetes detection program may be related to the survey.

Use of Statistical Services

Statistical services at the local level can be provided by a trained biostatistician or by an office of biostatistics utilizing all grades of statistical training, beginning with the untrained junior clerks, but under the supervision of a trained biostatistician; and by other personnel with graduate training in public health who should have had some foundation in statistical techniques. Recruitment of personnel for statistical work at the local level is necessarily difficult unless the local health department is situated near and working closely with a university offering some courses in statistics. In-service training, at least in mathematical statistics, is usually difficult and probably not feasible. However, many of the functions of collecting basic statistical data—the registration of births and deaths and reporting of morbidity—can be handled by statistical clerks, who benefit greatly by such in-service training.

State-Local Relationship

What statistical services should be supplied by the State department of health? Whether the local department is large or small, there are standards of uniformity which can be supplied only from the State level. Reporting of disease and death and birth registration should be standardized by the State health department. Frequently, this is not simple. Querying of death records may occur at four levels—the local registration district, the local health department, the State health department, and the Federal agencies. Only by agreement on forms, coding, and procedures can this information be standardized.

Few local health departments have either the statistical machinery or the funds to purchase mechanical statistical services. Yet most of them have, either on an annual or accumulative basis, masses of vital statistics, of service records, and of other quantitative information from which much more could be learned through machine analysis if available through the State agency.

The statistical division of the State department of health should provide consultation services on special problems in the local health district. These problems might be in the setting up of record forms (where statistical advice should always be sought), on the planning of field studies or surveys, and wherever possible, on the localization of morbidity and mortality figures on census tract or other small unit bases.

Related to this, most local departments must depend upon the State office of vital statistics for intercensal population estimates, without which localization of service record figures and other vital statistics can mean little.

The State biostatistician can help in still another area by assuring some degree of uniformity to the state-wide vital statistics reports. This would seem to be self-evident, but too often from year to year the tabulations available are not directly comparable with preceding tabulations, either because of different table arrangements, different population breaks, or different age groups.

The Local Biostatistician

In most instances, the State health department is the only training ground available for local health department biostatisticians. This does not mean that experience with the State unit necessarily qualifies the beginning biostat-

istician for local health work. There should definitely be a two-way interchange between local and State health units for the beginning biostatistician to see the problems as well as the advantages to be met at both levels. Some functions are best performed at the local level. Death certificiate querying is a point in illustration. The local health administrator knows his physicians personally and knows the hospital record room personnel. Because he is familiar with local medical teaching practices, he is much better equipped to obtain the basic death data than someone miles away who is less familiar with the local situation.

Similarly, most work with local service records can be done only in terms of the local administrator's knowledge of what goes into the records. However, in training as well as in the other areas of cooperation between local and State departments, effectiveness of any joint activity will depend on the degree of understanding and acceptance of each department by the other.

Finally, there are at least four basic ways in which the well-trained biostatistician can help the local health administrator. First, he can improve the quality of basic vital statistics and service data available locally by guiding in-service training and hospital staff indoctrination on birth, death, morbidity, and service reporting. Second, he can extend the scope of morbidity occurrence data by guiding local morbidity surveys of nonreportable disease and health conditions. Third, he can encourage the most effective use of statistics and quantitative thinking in the local department of health by constant participation in staff conferences, through consultations with other staff members, and by promoting the use of optimum methods of collecting and handling available data. Fourth, he can strive toward the development of service-yield indexes by working with the field staff in providing ways of relating service figures to appropriate yields in improved social factors related to those local service activities.

The problem of communications is important if each member of the health team, including the biostatistician, is to contribute his utmost wherever possible. To make such contributions possible, the opportunity for communication must be provided.

It is the health administrator's responsibility to bring together, systematically and frequently, the program directors, the field supervising group, and such staff specialists as the biostatistician, the health educator, and the personnel director. This we do in Erie County through monthly division and bureau conferences—seven in all. There is no excuse on either side to plead ignorance of the mutual opportunities for working together. Demonstration of needs—and help in meeting needs from both directions and over a lengthening period of time—point up the value of staff conferences.

Conclusion

The local health officer finds it most important to relate vital statistics and health services, not merely to geographic areas, but according to the characteristics of the people living in those geographic areas.

Statistical services can serve as program aids—in planning, control, evaluation, and promotion.

Because statistics are intrinsically quantitative, it is easy to overlook the quality or validity of base data. A continuing effort should be made in the local health department to broaden the scope and improve the accuracy of these base data.

More work must be done to demonstrate measurable relationships between disease and social factors. These relationships are part of the anatomy and physiology of a community, which, with its prevalent pathogenic parasites, may determine the community's pattern of health and disease.

The Medical Entomologist in Public Health

By E. HAROLD HINMAN, M.D., Ph.D., M.P.H.

In the period from 1897 to 1920, before the birth of medical entomology as a scientific discipline, the greatest discoveries in the role of arthropods in the transmission of human diseases were made by physicians, pathologists, bacteriologists, and others who had no basic interest in entomology. In 1879 Manson, a physician, discovered the part played by mosquitoes in the development of the filarial worm and later developed the mosquito theory of malaria transmission. Ross, another physician, tested this theory in 1897–98, and had his results confirmed promptly by British and Italian workers. Theobald Smith, a pathologist, with Kilbourne, in 1893 demonstrated that the cattle tick was the intermediate host of Texas fever of cattle.

In 1900 the American Yellow Fever Commission, consisting of Reed, Carroll, Lazear, and Agramonte, demonstrated the role of mosquitoes in the spread of yellow fever. In the early twentieth century, the role of fleas as vectors of plague was determined by Simond in 1898; of mosquitoes in the transmission of dengue by Graham in 1902; of ticks as vectors of relapsing fever by Ross and Milne in 1904; and Rocky Mountain spotted fever by Ricketts in 1906; and of body lice in the transmission of epidemic typhus by Nicolle et al. in 1909. The role of sandflies in pappataci fever and oroya fever, of mites in scrub typhus, and of deerflies in tularemia followed promptly. Most of these discoveries were made by physicians, pathologists, or bacteriologists, who "skimmed the cream" off the available knowledge of these arthropod-human disease relationships. Meanwhile, the entomologist was concerned primarily with the life history and control of various arthropods, but was rarely called upon, even as a consultant, in the prevention of these particular diseases.

Dr. Hinman is dean of the University of Puerto Rico, San Juan, P. R. He was formerly director of the School of Public Health, University of Oklahoma, Norman, Okla. *This paper was read by title at the meeting of the health officers section of the Southern Branch of the American Public Health Association, Baltimore, Md., April 17, 1952.*

Medical Entomology, 1920–41

The two decades preceding World War II may be looked upon as the time of serious development of medical entomology. The parent science, entomology, had achieved some maturity by 1920, and in the United States such universities as Cornell, Minnesota, and California, with strong departments of entomology, had already established special courses in medical entomology. This gradually provided the nucleus of a small group of trained workers. The Bureau of Entomology (U. S. Department of Agriculture), the Public Health Service, and a few experiment stations employed an occasional entomologist for the study of vectors of human or animal diseases. A few special research institutes, such as the Gorgas Memorial Institute, retained a medical entomologist as a full-time staff member. The Rockefeller Foundation also employed a few medical entomologists. The Tennessee Valley Authority followed suit a number of years later.

Health departments were much slower than Government organizations and private foundations to accept the entomologist as a useful member of their professional team. In the United States, Dr. L. L. Williams, Jr., of the Public Health Service, developed the idea of a special

malaria control division in each of the southern State health departments and entomologists were given a prominent place. A group of engineers, entomologists, and medical officers were trained in malaria control during the summer of 1937 at the Rockefeller Foundation Malaria Station in Tallahassee, Fla., the Bureau of Entomology and Plant Quarantine (U. S. Department of Agriculture), the Public Health Service, and the Tennessee Valley Authority for employment in southern State health departments.

During these two decades, a great mass of medically important taxonomic, ecological, biological, and control data on arthropods was assembled. Three textbooks, by Herms, by Matheson, and by Riley and Johannsen, appeared in the United States. Numerous monographs and serial publications attest to the productivity of workers in medical entomology during this period. The Fourth International Congress of Entomology, held at Ithaca, N. Y., in 1928, had a section devoted to medical and veterinary entomology. By 1941 the science had truly come of age and the medical entomologist was recognized as a specialist by his fellow entomologists.

Despite these evidences of progress in establishing medical entomology as an important specialty, I seriously doubt that, with the exception of malaria control organizations, the average public health worker felt any spirit of kinship with the medical entomologist.

Another noteworthy exception to the recognition of entomological contributions was the utilization of entomologists in connection with mosquito abatement districts. Legislation in 1904 in New Jersey declared the mosquito to be a pest and directed boards of health to abate it. In California the law providing for the mosquito abatement districts was passed in 1915. In most instances these programs were directed against pest mosquitoes.

Medical Entomology, 1941 to Date

World War II drastically changed the status of the medical entomologist as a member of the health team. The Sanitary Corps of the Division of Preventive Medicine, Medical Corps of the Army, eagerly sought not only medical entomologists but general entomologists and even individuals with relatively little entomological training. Much of the early major fighting was in areas where malaria was often a greater problem than the enemy. Entomologists in research organizations also responded and were able to improve insecticides as well as techniques for the control of body lice, anopheline mosquitoes, and various other arthropods of medical importance. These newer tools gave the field man an opportunity to demonstrate the worth of entomologists. The Public Health Service, in discharging its responsibility for sanitation around military installations, organized the malaria control in war areas program. Its great success, plus the national downward trend in malaria cases, led them to embark upon an extended program and, subsequently, to undertake the national 5-year eradication program. The success of these campaigns may be ascribed in a goodly measure to the capability and devotion of their entomologists. Other notable malaria control campaigns, such as the *Anopheles gambiae* programs in Brazil and Egypt, and the programs in Venezuela, Sardinia, and Cyprus, have been planned and successfully executed due to the major contributions of entomologists. The yellow fever riddle (urban vs. jungle fever) was solved in a great measure by entomological and epidemiological investigations.

In the past 10 years the entomologist has made just as amazing progress in the laboratory as in field control operations. The screening of many thousands of substances for insecticidal, larvicidal, or ovicidal properties has not only developed new toxicants and formulations but also new "assembly line" techniques for rearing arthropods in the laboratory and for developing important new biological data. Anyone who has not visited the Orlando laboratory of the Bureau of Entomology and Plant Quarantine, or the Technical Development Services of the Public Health Service Communicable Disease Center in Savannah, has missed an opportunity to become acquainted with the ingenuity and industry of medical entomologists.

The Future

Some four or five years ago there was considerable sentiment among certain public health

workers, whose reputation placed them in the category of so-called elder statesmen, that DDT, BHC, and possibly some undiscovered insecticides would spell the doom not only of malaria, but probably of most other arthropod-borne infections. I was informed that there was no future in malaria control or in medical entomology.

As more adequate testing and large-scale control programs got under way, the potency of DDT and other toxicants was attested to; however, a number of problems, some of them administrative and some apparently due to the fact that arthropods have not "read the book," have lead us to the conclusion that the panacea is still not yet available.

Resistance to DDT was first noted in houseflies, then in culicines, subsequently in anopheline mosquitos, and later in body lice and in several other species of public health importance. This development of resistance to insecticides impresses upon us the need for more detailed studies on the physiology and general biology of disease vectors by the entomologist.

I believe it is now generally recognized as only a temporary illusion that residual sprays alone would permanently eradicate malaria or any other arthropod-borne disease. Certain biological factors can usually be found to account for the inadequacy of residual sprays, such as unusual resting habits and development of resistance. However, I believe the newer toxicants have more firmly than ever established the need for the medical entomologist.

The extensive routine adoption of the use of synthetic toxicants in the control of household or premise pests of man has tremendously increased the possibility of introducing poisonous materials into the food or drink or air taken in by man or his animals. The frequent opportunities for human contact with these materials has emphasized the importance of entomologists trained in toxicology.

Another development that may be anticipated in the future, on the basis of recent trends, is an increased interest in the role of arthropods in transmission of such diseases as encephalitis, Q fever, tularemia, and plague, and in the part played by muscoidean flies and roaches in the transmission of salmonellosis and shigellosis. Because of these trends, I feel confident that medical entomologists will be sought after and will continue to play an important role in public health along with other workers in that field.

Administrative Problems

In the evolution of public health work, emphasis originally was placed upon the control of epidemics. Gradually other communicable disease control activities began to receive more attention. In all of this work, physicians properly assumed leadership. It was also quite natural that doctors of medicine in public health should turn to able nurses in this program. As the role of the environment became better recognized, sanitary engineers and other sanitation workers established their positions in health departments. Public health laboratories had to be organized to execute a program of communicable disease control and environmental sanitation. Health education later became a "respectable" aspect of the public health program.

Medical entomologists are really the "Johnnie came lately" people in public health. The 1937 organization of malaria control teams placed them in State health departments for the first time. But had not the MCWA and its extended program and the CDC eradication program evolved, the entomologists probably would have completely disappeared even in the southern State health departments. Originally, a malaria division was established either in the bureau of sanitary engineering or as a part of the division of epidemiology. Because the practical application represented control of the environment, the medical entomologist usually ended up under the administrative direction of the State sanitary engineer. In the current transitional stage of the malaria eradication program, the entomologist is holding his own since the problem is largely one of surveillance. In one southern State health department, a subdivision of entomology has been organized within the division of sanitary engineering and is responsible for licensing and supervising pest control operators. In another State health department, a separate bureau of vector control has been established within the division of environmental sanitation. This bureau in 1946 was given the responsibility for the administra-

tion of a $400,000 subvention for local mosquito abatement work. Whether this pattern of placing pest mosquito control under supervision of State or local health departments will be widely adopted is not known because certain experiment station programs have become deeply involved in mosquito abatement. Similarly, the supervision of pest control operators has varied in its administrative allocation. In any event, the interests of the State health departments must be recognized in both disease control and environmental sanitation.

Training for Health Work

In a few of the branches of our Federal service, we find a sharp demand for the highly trained and specialized medical entomologist. I believe this will rarely be the case in State or local health departments. In the latter, there is much more likely to arise the need for a well-trained biologist with some special emphasis in medical entomology, in rodent ecology, in herpetology, in limnology (for stream pollution), in snail ecology, and in parasitology. The organization of the biology section within the Southern Branch of the American Public Health Association was a long-delayed recognition of the important contribution that biologists have made and are making in public health. Health departments below the Federal level have placed much greater emphasis upon operations than upon research. They have long worked upon the principle of teamwork and demanded versatility of the members of the team. If medical entomology is to make its maximum contribution in public health, its representatives will probably need to participate in vector control (rats included), in aquatic biology in connection with stream pollution problems, in pest mosquito control activities, and may possibly need to represent the health department in relations with commercial pest control operators.

Public Health Nursing Study

A study to determine the amount and kind of nursing services required to meet minimum public health nursing needs in local health departments was begun recently by the Division of Public Health Nursing, Bureau of State Services, Public Health Service. A 17-member committee, composed of national leaders in public health nursing, specialists in social research, and State and local health officials, is serving in an advisory capacity.

The study is attempting to answer such basic questions as (1) how much additional nursing service is needed in the rapidly expanding defense areas; (2) how can the available nursing supply be "stretched" to meet increasing needs; (3) how can practical nurses or other aids be used most advantageously in public health programs. It will supplement the over-all functional study being made by the American Nurses Association.

The shortage of nursing personnel, particularly public health nurses, has reached the acute stage. The presently accepted ratio of one public health nurse for every 5,000 population would require an additional 17,500 nurses. To supply 1 nurse for every 2,000 population, a ratio which has been suggested to meet increasing needs for nursing care of the chronically ill and aged patients, 40,000 to 50,000 nurses would be required.

The Tuberculosis Problem

By RUSSELL E. TEAGUE, M.D.

In almost all of its aspects, the rapidly changing picture of the tuberculosis problem in the United States presents one of the most profound sociobiological phenomena, if not the most interesting development, in the entire field of medicine and epidemiology. It is significant, if not paradoxical, that, as many aspects of the disease decline or diminish at an accelerated rate, the program for control continues to expand.

Decline in Infection Rate

Results of tuberculin tests of sample populations in Philadelphia in 1949 seem to indicate that today individuals are being infected with the tubercle bacillus at an average rate of less than 1 percent per year, or one new tuberculosis infection per 100 person-years of life.

Data from three studies at the Henry Phipps Institute in Philadelphia bear out this observation. In these studies, children in three large high schools were tested at 10-year intervals—in 1929, 1939, and 1949. In 1929 the average rate of conversion to the first test dose of tuberculin was 5.3 per 100 person-years; in 1939, this rate was 2.7; and in 1949, less than 1. At the average age of 16 years, in all three studies, the percentages of children who were positive to the first test dose of tuberculin were: 1929, 84 percent; 1939, 43 percent; and 1949, 16 percent.

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If conversion to the first test dose of tuberculin indicates acquired tuberculous infection or exposure to the tubercle bacillus, the average individual living in Philadelphia under the 1929 rate would have had a new experience with the tubercle bacillus at least three times during his life, whereas if he had lived under the 1949 rate, the chance that he would not be infected at all would be about 50 percent.

It is being recognized and widely accepted that evidence of infection—a positive tuberculin test and especially a recent conversion—becomes more helpful and significant today than in the past. This is true from the viewpoint of the epidemiologist, the diagnostician, and the therapist.

Morbidity

A compilation and preliminary analysis of tuberculosis reports from the States, recently prepared by the Division of Chronic Disease and Tuberculosis of the Public Health Service, provides a source for morbidity data for 1951.

According to this report, 118,414 new cases were reported in the United States in 1951. Although this figure may not be final for the year, it represents a decline of less than 3 percent from the number reported for 1950, and 12.3 percent from the 1947 total. The average annual decline in reported cases since 1947 is 3.07 percent per year.

In view of the intensified case finding during this period, these data are encouraging. The reported case rates for the white and the nonwhite cases were 68.1 and 165.3 per 100,000 population, respectively. For white and for nonwhite males the respective rates were 86.6 and 194.8; for white and for nonwhite females, 49.9 and 136.1.

There were four new cases reported in 1951 for each tuberculosis death reported, an improvement in the ratio when compared to 2.8 cases per death in 1947, 3.1 in 1948, 3.4 in 1949, and 3.6 in 1950. The case-death ratio remains higher for whites than for nonwhites and higher for females than for males.

Mortality

In 1950 there were 33,577 deaths from tuberculosis, or 2.3 percent of the total deaths from all causes for that year. Compilations of the total number of deaths reported for 1951 have not been completed, but, based on a 10-percent sample study made by the National Office of Vital Statistics, Public Health Service, the decline in the number of deaths from tuberculosis from 1950 to 1951 was about 11 percent for the country.

The number of deaths from tuberculosis, as well as evidence of infection and morbidity, is dropping faster in the younger age groups and in females than in older males. In 1952, 75 percent of the population of many sanatoriums were males, most of them in the advanced age group.

Longevity of Pulmonary Tuberculosis Patients

My recent life table study of the longevity of all clinic patients diagnosed as having active tuberculosis at the Henry Phipps Institute in the 20-year period between 1926 and 1945 indicates that the average longevity of these patients is 5.9 years. While the whites lived 11.2 years, the average length of life of the nonwhites was 3.5 years.

The cases diagnosed in the minimal stage averaged 25.1 years of life after diagnosis, those in the moderately advanced stage, 9.9 years, while those diagnosed in the far-advanced stage averaged only 1.1 years.

There was no difference in the case fatality rates when the number of cases in the first 10-year period was compared with those in the latter 10-year period. With recent improvements in therapy, however, marked improvement in the case-fatality rates of the patients diagnosed in 1952 would be expected.

Despite the improved picture of the disease, activities directed toward meeting the problem continue to increase.

Case Finding

In 1951, reports indicate that about 13,000,000 chest X-rays were made by States and by the agencies reporting to them. This amounts to 8.2 percent of the total population of the country. In three States the number of X-rays taken amounted to more than 20 percent of their population last year.

Recent studies on familial susceptibility and resistance emphasize the importance of heredity in epidemiology and point out that in the future case finding may very well be directed toward continued medical supervision of the blood relatives of known cases, wherever they may reside.

Isolation and Treatment

Since the prevention of this disease is directly proportional to the number of patient-days of effective islation, it is encouraging that more beds are becoming available each year for tuberculosis patients. More chest surgery and chemotherapy should eventually result in shorter periods of hospitalization and thereby permit more beds for more patients.

The problem of isolation of the "good chronic" patient has not yet been solved in most areas, and agencies and health administrators are concerned with this problem to an increasing degree.

The management of the recalcitrant infectious patient is being met in many areas by compulsory isolation procedures, and there is evidence of more widespread application of these techniques.

Public health administrators and sanatorium superintendents are plagued with a shortage of personnel, especially nurses, and the trend toward using nonprofessional aides is increasing.

Rehabilitation

Rehabilitation programs for tuberculous patients have not been developed universally.

With a few outstanding exceptions, this part of the problem is yet to be expanded generally.

Immunization

Three States have provided a BCG immunization program for medical students, nurses, and children of infected families. A number of other areas are using vaccination on a more limited basis. The wide-scale use of mass BCG vaccination will undoubtedly be limited to those parts of the world where infection is high and other facilities for control are limited.

The Future

In recent years advances have been made in the fundamental knowledge of tuberculosis in the fields of pathology, bacteriology, immunology, epidemiology, public health techniques, therapy, genetics, and social services, and the total expansion in the whole field of tuberculosis research is heartening. Barring a national catastrophe, it is not illogical to assume that in one more generation the "great white plague" will no longer be a major public health problem in the United States, but this does not mean that we can ever relax our vigilance.

On the other hand, the prevention program must be intensified. Then education of the layman will be more difficult and it will cost much more to find the unknown case, but there will be less expense for tuberculosis hospital beds, and more institutional space will be available for isolation of the "good chronics" that remain. More attention will be paid to the hereditary factors in infection. Greater efforts will be given to preventing the entry of tuberculous patients from parts of the world where high rates prevail, and concern may be expressed about the danger of our unexposed, tuberculin-negative population even visiting in areas of high infection. This concern may not be justified and only further studies will give the answer.

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Children With Heart Disease Aided

The third in a network of such services in the country, facilities at the Children's Memorial Hospital, Chicago, Ill., will be used to aid children with serious heart conditions, such as "blue babies" whose condition can be helped by surgery, through a special grant by the Children's Bureau of the Federal Security Agency.

This facility will serve Michigan, Ohio, Kentucky, Minnesota, Wisconsin, Indiana, North Dakota, South Dakota, Nebraska, Iowa, Kansas, and Missouri. Illinois already provides service for children under their crippled children's program.

Two other such centers are already in operation in Connecticut and California. Other programs are planned in the East and Southwest.

Group Chest X-ray Examinations And the Tuberculosis Death Rate

By PHILIP ENTERLINE, B.B.A.

The rapid increase in the number of group chest X-ray examinations as a case-finding procedure is one of the interesting postwar developments in the field of tuberculosis control. During 1946, about 6 million X-rays were taken in the United States for the detection of chest disease, excluding chest X-ray examinations by the armed forces and the Veterans Administration (*1*). In 1950, comparable information submitted to the Division of Chronic Disease and Tuberculosis of the Public Health Service indicated that about 15 million X-rays were taken. The geographic distribution of mass chest X-ray activities, and the apparent relationship between the intensity of these activities and the striking decline in the tuberculosis death rate during this period are reported here.

Since July 1947, a semiannual tuberculosis report (PHS 1394 TB) has been requested by the Public Health Service from each State health department and the District of Columbia for the 6-month periods ending in December and June. These reports give the number of individuals examined on mass radiography projects in each State and the District of Columbia. Mass radiography projects are defined as "any group X-ray examinations, including contacts, regardless of the size of films, taken for the purpose of detecting pulmonary pathology, but not for the identification of pathology or determination of activity." The instructions further state that "medical examinations, including X-rays taken in the offices of private physicians or in clinics for the purpose of final diagnosis of tuberculosis or determination of activity, are not to be included."

Because of reporting difficulties within the States, the information actually reported probably understates the true totals in many instances. The magnitude of this error is impossible to calculate, and the data shown here should, for the most part, be considered as minimum estimates. Crude estimates were made for a few periods for which reports were not received or for which a report indicated that a sizeable area of the State was omitted. In some instances, the necessary estimates were obtained from local publications, while in others they were based on reports for preceding or succeeding periods.

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Relative Intensity of X-ray Activities

Figure 1 shows the number of X-ray examinations estimated and reported for the years 1946 through 1950. The 1947 figure is an estimate based on reports received for the last 6 months of that year, while the figures for later years are essentially those actually reported. During the period 1946–49, the number of examinations increased by about 2.5 million each year; from 1949 to 1950 the increment was about a million.

The table summarizes data reported by each State during the 3½-year period ended in December 1950 and, in addition, shows aggregate information for nine geographic regions. The

total number of X-rays taken in the United States was 44,000,000, with an average of about 12.5 million per year. Column 3 of the table shows the average annual percentages of the population X-rayed in each State and the District of Columbia, and in each of nine regions. For the United States as a whole, an average of 8.6 percent of the population was X-rayed annually, while for individual reporting areas the average ranged from a high of 26.5 percent for the District of Columbia to 1.5 percent for Idaho. States with a fairly high average annual percentage of their population X-rayed during this period include: Minnesota, 16.8 percent; Florida, 16.5 percent; Colorado, 15.3 percent; and Washington, 25.7 percent.

The figures shown for the percentages of population X-rayed annually may be overstated somewhat because some persons receive more than one X-ray during a single year. However, since it is generally recommended that chest X-ray examinations be made annually, it is un-

Chest X-ray examinations and tuberculosis deaths in the United States, by regions and States, 1947–50

Geographic region [1] and State	Total X-ray examinations July 1947–Dec. 1950 [2]	Average annual number of X-ray examinations, column (1) ÷ 3½	Average annual percent of population examined, column (2) as percent of July 1, 1949, population [3]	Tuberculosis death rate, 1947 [4]	Tuberculosis death rate, 1950 [5]	Percentage decline in tuberculosis death rate
	(1)	(2)	(3)	(4)	(5)	(6)
Grand total	**44, 365, 799**	**12, 675, 944**	**8. 6**	**33. 5**	**22. 2**	**33. 7**
New England	**3, 017, 057**	**862, 016**	**9. 3**	**29. 7**	**18. 6**	**37. 4**
Maine	166, 989	47, 711	5. 3			
New Hampshire	93, 921	26, 835	5. 2			
Vermont	80, 596	23, 027	6. 3			
Massachusetts	1, 842, 081	526, 309	11. 1			
Rhode Island	272, 297	77, 799	10. 0			
Connecticut	561, 173	160, 335	8. 0			
Middle Atlantic	**3, 877, 520**	**1, 107, 863**	**3. 7**	**35. 2**	**24. 3**	**31. 0**
New York	2, 701, 225	771, 779	5. 2			
New Jersey	605, 379	172, 965	3. 6			
Pennsylvania	570, 916	163, 119	1. 6			
East North Central	**8, 338, 086**	**2, 382, 311**	**7. 9**	**29. 3**	**19. 8**	**32. 4**
Ohio	2, 698, 972	771, 135	9. 7			
Indiana	1, 095, 660	313, 046	8. 0			
Illinois	2, 186, 134	624, 610	7. 3			
Michigan	1, 368, 487	390, 996	6. 2			
Wisconsin	988, 833	282, 524	8. 5			
West North Central	**4, 261, 621**	**1, 217, 606**	**8. 9**	**21. 5**	**13. 7**	**36. 3**
Minnesota	1, 718, 592	491, 026	16. 8			
Iowa	506, 256	144, 645	5. 7			
Missouri	656, 312	187, 518	4. 8			
North Dakota	252, 611	72, 175	12. 4			
South Dakota	243, 856	69, 673	11. 3			
Nebraska	380, 591	108, 740	8. 5			
Kansas	503, 403	143, 829	7. 8			
South Atlantic	**7, 264, 888**	**2, 075, 684**	**10. 2**	**37. 6**	**23. 9**	**36. 4**
Delaware	84, 018	24, 005	7. 5			
Maryland	750, 536	214, 439	9. 3			
District of Columbia	751, 543	214, 727	26. 5			
Virginia	1, 266, 019	361, 720	11. 3			
West Virginia	377, 922	107, 978	5. 6			
North Carolina	891, 663	254, 761	6. 6			
South Carolina	553, 795	158, 227	8. 0			
Georgia	1, 068, 048	305, 157	9. 2			
Florida	1, 521, 344	434, 670	16. 5			

See bottom of table for footnotes.

Continued ▶

Chest X-ray examinations and tuberculosis deaths in the United States, by regions and States, 1947–50—Continued

Geographic region [1] and State	Total X-ray examinations July 1947–Dec. 1950 [2]	Average annual number of X-ray examinations, column (1)÷3½	Average annual percent of population examined, column (2) as percent of July 1, 1949, population [3]	Tuberculosis death rate, 1947 [4]	Tuberculosis death rate, 1950 [5]	Percentage decline in tuberculosis death rate
	(1)	(2)	(3)	(4)	(5)	(6)
East South Central	**3, 900, 172**	**1, 114, 334**	**10. 0**	**45. 3**	**30. 3**	**33. 1**
Kentucky	704, 740	201, 354	7. 1			
Tennessee	1, 696, 238	484, 639	14. 9			
Alabama	707, 924	202, 264	6. 8			
Mississippi	791, 270	226, 077	10. 9			
West South Central	**4, 071, 175**	**1, 163, 193**	**8. 2**	**38. 1**	**26. 4**	**30. 7**
Arkansas	699, 964	199, 990	11. 0			
Louisiana	819, 207	234, 059	8. 9			
Oklahoma	851, 615	243, 319	11. 5			
Texas	1, 700, 389	485, 825	6. 4			
Mountain	**1, 800, 955**	**514, 558**	**10. 7**	**39. 4**	**25. 2**	**36. 0**
Montana	251, 040	71, 726	12. 9			
Idaho	29, 296	8, 370	1. 5			
Wyoming	75, 940	21, 697	8. 0			
Colorado	661, 508	189, 002	15. 3			
New Mexico	166, 521	47, 577	7. 7			
Arizona	293, 408	83, 831	11. 7			
Utah	300, 120	85, 749	12. 7			
Nevada	23, 122	6, 606	4. 2			
Pacific	**7, 834, 325**	**2, 238, 379**	**15. 8**	**31. 8**	**19. 1**	**39. 9**
Washington	2, 080, 319	594, 377	25. 7			
Oregon	698, 697	199, 628	13. 4			
California	5, 055, 309	1, 444, 374	14. 0			

[1] Groupings by the U. S. Bureau of the Census.

[2] From semiannual tuberculosis reports (PHS 1394 TB).

[3] Civilian population estimated as of July 1, 1949, from current population reports, population estimates, series P–25, No. 47, U. S. Bureau of the Census.

[4] Death rates, tuberculosis (all forms) from Vital Statistics of the United States, part I, 1947.

[5] Bulletin of the National Tuberculosis Association, September 1951. (A 10-percent sample of the death certificates by the National Office of Vital Statistics yielded the same rate for the United States (22.2) for 1950.)

likely that the number of repeat X-rays is very great in any one year. Moreover, the extent to which the percentages are overstated is probably about the same from one State to another, so that direct comparisons would seem valid.

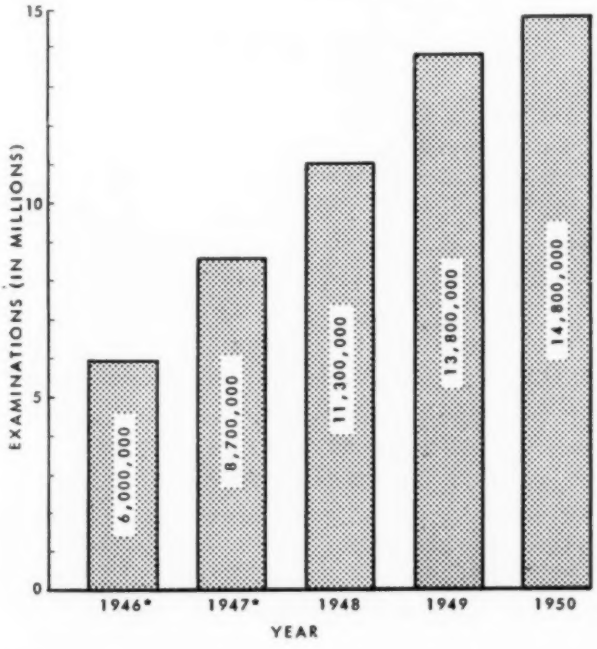
X-ray Activities and Death Rate Decline

From 1947 to 1950, the tuberculosis death rate (all forms) dropped from 33.5 to 22.2—a decline of 34 percent. This is the largest percentage drop recorded for the United States during any 3-year period since 1921. The only greater percentage drop ever recorded was for the years 1918–21 when the tuberculosis death rate (all forms) dropped from 149.9 to 98.6—a decline of 35 percent. The 1918 rate was abnormally high, however, and the 1947–50 drop is probably the more significant one.

It would be difficult indeed to isolate any single factor responsible for this favorable experience. Historically, fluctuations in the decline in the tuberculosis death rate have shown little association with the development and application of any new public health techniques and therapeutic measures. Certainly, improvements in housing and general living conditions have been of major importance and may be largely responsible for the postwar decline in tuberculosis deaths. Improvements in case finding, resulting in earlier discovery of the disease, as well as advances in therapy, also have no

doubt contributed to the decline in the death rate as evidenced by the steady decrease since World War II in the percentage of persons discharged from tuberculosis sanatoriums because of death (*2–4*).

There appears to be some relationship between the intensity of case-finding activities in each of the nine geographic regions tabulated and the decline in the death rate in those regions. This relationship is shown graphically in figure 2. Where the average annual percentage of the population examined was greatest, the percentage decrease in the death rates tends to be greatest as well. (The simple correlation coefficient is 0.800. This is statistically significant at the 1-percent level.) Conversely, where the average percentage is smallest, the decrease tends to be smallest. Although this might appear to suggest that the decline in death rates is attributable to X-ray activities, this is not necessarily true. Both may, in fact, be a result



* Estimated

Figure 1. Chest X-ray examinations in the United States, 1946–50.

of treatment facilities, standard of living, or over-all health department activities.

When the relationship between the number of X-rays taken and the decline in death rate is studied by States rather than by regions, some of this association disappears. This is largely because in such a comparison the less populous States receive the same weighting as

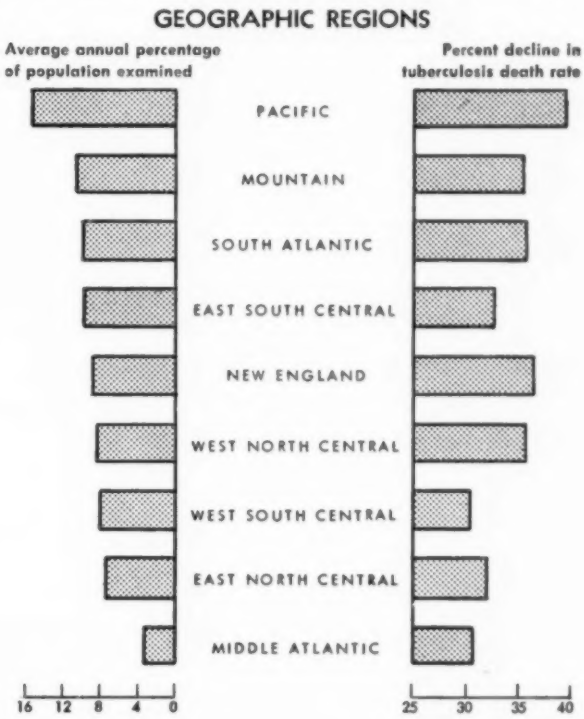


Figure 2. Average annual percentage of population examined and percentage decline in tuberculosis death rate, by geographic regions, 1947–50.

the larger States, and because an unusually great number of these smaller States either had a small percentage of the population examined and a large drop in mortality, or a large percentage of the population examined and a small drop in mortality. More homogenous areas than States are therefore needed for analysis—hence, the use of regions in this report.

Summary

1. The number of chest X-ray examinations in the United States increased from about 6 million in 1946 to 15 million in 1950.

2. On the average, about 8.5 percent of the population of the United States was examined by X-ray during each of the years 1947 through 1950.

3. When data are studied by geographic region, there appears to be a positive relationship

between the emphasis placed on chest X-ray activities and the decline in the tuberculosis mortality rate.

* * *

Reports thus far received for 1951 show a considerable decline in the number of chest X-ray examinations. Probably only about 13 million were made—a decrease of 2 million as compared with 1950. This decrease was greatly accelerated during the last 6 months of 1951, with the total number of examinations for that period nearly 1.5 million below the total for the corresponding 6-month period in 1950.

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Prevalence of Tuberculosis in the United States

Current estimates place the number of active tuberculosis cases in the United States at 400,000. Of this number 150,000 are undiscovered.

These figures replace the half-million estimate, widely used during the past decade, which was based on tuberculosis mortality data. The new estimate is based upon the findings of chest X-ray programs throughout the country, plus an inventory of tuberculosis cases registered with local health departments. A joint committee of the National Tuberculosis Association and the Division of Chronic Disease and Tuberculosis of the Public Health Service prepared the new estimate.

Recent chest X-ray surveys of adult populations (15 years of age and over) have revealed approximately one active case for every 1,000 examinations. Since there are approximately 110 million adults in the United States, the committee believed that there were probably at least 110,000 undiscovered active cases of tuberculosis. The upward adjustment of this 110,000 estimate to 150,000 was based upon the belief that estimates from surveys tend to understate the true prevalence of undiscovered tuberculosis and to compensate for the omission of the active cases in the population under 15 years of age.

Information available from health department case registers in all parts of the country—operated under widely varying conditions and representing about one-fourth of the population of the United States—indicates that for the country as a whole there are records for about 250,000 active tuberculosis cases. This figure, when added to the estimated 150,000 undiscovered active cases, yields the 400,000 figure.

In addition, the committee estimated that there are 800,000 important inactive cases of tuberculosis in the country, 550,000 of them currently undiscovered. This estimate was also based upon the findings of chest X-ray programs and an inventory of tuberculosis cases registered in the United States.

The current estimates released by the committee are summarized as follows:

	Total	*Known*	*Undiscovered*
Total	1,200,000	500,000	700,000
Active	400,000	250,000	150,000
Inactive	800,000	250,000	550,000

Public Health and Medicine At the Crossroads

By HERMAN E. HILLEBOE, M.D., M.P.H.

In these days of disorder, change, and impending disaster, we who are dedicated to the health and welfare of the people face tasks of greater challenge than we have ever known before. We have arrived at a stage in our social development, whether desirable or not, at which the people turn to us increasingly for aid and guidance. This is a grave responsibility. Under its burden and facing its humane demands, we are compelled to review the adequacy of our guiding principles.

Public health is at the crossroads. We must now choose the direction that we shall take in the future, or it will be chosen for us.

The concept of health department services to the people has undergone dramatic change. Advancing medical knowledge and public health activities have sharply decreased morbidity and mortality from the communicable diseases. Improved working conditions, better nutrition, more attention to preventive medical services in the schools, and similar social forces have contributed to improved health and welfare. Environmental sanitation programs are well on their way. Means have been provided and successful methods have been developed for the expansion of environmental health activities.

It is plain that, in the future, the theory and practice of public health must be expanded to include a vigorous attack upon the chronic diseases, with special attention to heart disease and cancer, which are the principal killers and disablers in our Nation.

We need new knowledge, new methods, and new measurements for evaluating our programs. As the demands of communicable disease control continue to decrease, we must utilize our acquired skills in combating the ravages of the chronic diseases, an increasingly crucial problem for the private practitioner and the public health physician.

Dr. Hilleboe, commissioner of health for the State of New York, presented this paper at the first general session of the forty-eighth annual health conference of the State of New York, at Lake Placid, June 4, 1952.

Death Rates: New York

Where do we stand in New York State? The 1951 death rate from all causes in the State was 10.5 per 100,000 population. The death rate has never been lower. In 1940 the rate was 11.1. The degree of improvement is greater than these figures indicate. In the last decade the proportion of older persons, among whom mortality is inevitably high, has increased. Had the age distribution of the population in 1951 been the same as in 1940, the death rate would have been 9.2 instead of 10.5.

Infant mortality, 23.7 per 1,000 live births, was the lowest ever experienced and represents a drop of 36 percent since 1940. In the same interval, neonatal mortality decreased 28 percent, while that between 1 month and 1 year dropped 55 percent. Maternal mortality, 4.9 per 10,000 live and still births, also dropped to a new low record and was less than one-fifth of the rate in 1940.

New low levels were reached in 1951 by deaths from streptococcal sore throat (including

scarlet fever), whooping cough, and diphtheria. Deaths from streptococcal sore throat numbered 21 as contrasted with 107 in 1940. Deaths from whooping cough numbered 11, while in 1940 there were 138. Only two deaths were attributed to diphtheria; the previous low mark of nine occurred in 1944.

Among the diseases to which all ages are subject, the death rate per 100,000 population for 1951 in New York State, including New York City, was 4.0 for syphilis and 23.5 for tuberculosis. The death rates for these two human scourges were lower than ever before in our history. Indeed, the tuberculosis death rate for 1951 showed a drop of 9 percent over that of the preceding year and was 50 percent less than the rate in 1940. In this 11-year period, the tuberculosis death rate in New York City dropped 46 percent—from 54.4 to 29.5. In the rest of the State, the reduction was 50 percent—from 33.7 to the 1951 rate of 16.7.

Contrast these low rates with the awesome death rates of 184.4 from cancer and 459.8 from heart disease. To state them another way: 43 of every 100 deaths in upstate New York were due to heart disease; 17 out of every 100 deaths were due to cancer; and 11 out of every 100 deaths were from intercranial lesions of vascular origin. It is estimated that 1 out of every 20 persons in the United States suffers from some disorder of the cardiovascular system; every other death after the age of 45 years is caused by heart disease.

Cardiovascular Diseases

Public health epidemiology has made distinct contributions in the field of the cardiovascular diseases. The causes of beriberi, scurvy, and pellagra were elucidated almost solely by epidemiological methods—these methods contributed much to the understanding and prevention of heart disease associated with nutritional deficiencies. Again, the aggregation of rheumatic fever in families and the probable importance of hemolytic streptococcal infections in precipitating heart attacks were discovered largely by epidemiological studies.

In spite of these memorable advances, we seriously lack epidemiological knowledge of many types of cardiovascular disease. Our information concerning the prevalence of cardiac ailments is limited to selected fractions of the population. The causes of atherosclerosis, hypertension, and rheumatic fever are still unknown. Epidemiologists would be greatly aided in their study of the etiology and demography of cardiovascular diseases if public health workers could devise and test mass methods of screening the adult population for these diseases. Their use in large population groups would give us valuable data on the extent of the problem, and would enable us to bring large numbers of early cases under the supervision of family physicians.

Secondary Preventive Services

Research is being intensified on a broad front to find preventive measures that will help people to avoid heart disease. While this type of fundamental research is being pursued, we can use other approaches to the control of heart disease by strengthening our secondary preventive services. These are directed at the earliest detection of asymptomatic heart disease and the detection of early disease, so that the progression of clinical symptoms may be halted and further damage to the cardiovascular system avoided or minimized.

It is in this field of secondary prevention that health departments can make significant contributions. It is not enough to offer postgraduate courses for physicians, to develop nutritional weight control programs for the obese, or to acquaint the public with the problems of heart disease by means of the techniques of health education. If we are to assault the chronic diseases with the same vigor and success with which we attacked the communicable diseases, we must employ epidemiological methods in the exploration of these new fields. With only a few minor exceptions, we don't know how much heart disease there is in our communities. We do not know what types of heart disease are prelavent; nor do we know what types can be benefited by early detection. For atherosclerosis and coronary disease, we have no accurate mass case-finding methods.

Where, then, do we start and what do we do? There are two approaches that can be used by any health department large enough to employ

full-time public health physicians and with courage enough to explore uncharted fields in public health.

Athero-coronary disease is the major contributor to death in the cardiovascular group. The various tests used to detect it early have not been evaluated either as to their relative efficiency or mass applicability. However, such studies can be undertaken by any large health department that can obtain random samples of the adult population at risk, and that has both the equipment needed for a battery of tests and the necessary professional and technical staff to perform and evaluate the tests.

This is a formidable task, but so was the early detection of syphilis and tuberculosis. It is better to spend the next few years in the determination of the reliability, validity, yield, cost, and acceptability of screening methods for coronary disease than to wait and muddle through with whatever might be available in the distant future.

Public demands for heart disease control programs are daily gaining momentum. It is inevitable that we will find new screening methods as we test the old, discard the inefficient, and develop those that single out most efficiently the potential and real, though obscure, cases.

Since early this year the New York State Health Department has had a small study group working on this approach to the problems of coronary disease and hypertension. We will launch our program on a group of several hundred key personnel in our State government in the age groups over 40, in which coronary disease and hypertension death rates are high.

We intend to seek out the most effective methods of detecting coronary insufficiency before occlusion or hypertension or cardiac hypertrophy occur. As soon as we achieve adequate information concerning mass screening methods and have accurate knowledge of the groups most at risk, we shall extend our activities to a full-scale community program, with the close cooperation of health departments, private practitioners, and medical schools.

Public Health Approach

Those of us over 40 years of age have a personal as well as a professional interest in the public health approach to cardiovascular disease. Blumgart (*1*) found that among several hundred persons over 40 who died of noncardiac causes and who had shown no evidence of heart disease, 40 percent exhibited on autopsy considerable hardening and narrowing of the coronary arteries. I urge initiation and pursuit of specific epidemiological studies.

The second approach to the problem of heart disease can best be made by county and city health departments because of their proximity to the sufferers from heart disease who will be needed for such studies. Specifically, I refer to the several hundred thousand chest X-ray films taken each year for the purpose of tuberculosis case finding. Rutstein, Williamson, and Moore (*2*), in their Boston study which was reported in November 1951, have clearly demonstrated that it is possible by means of 70-mm. photofluorographic film to identify in the general population a significant number of persons who have previously unknown heart disease. To be sure, skilled cardiologists must reread the films. When this is done, three times as many abnormal hearts are found as when less-skilled film readers review the films. In addition, persons with abnormal hearts must be referred to clinicians and followed up by their private physicians.

Here is an extraordinary opportunity for the health officer to initiate cooperative activity of major importance between the health department and the medical profession. Great benefits will accrue to thousands of cardiac patients in terms of productivity, personal happiness, and prolonged life.

Rutstein and his colleagues (*2*) point out that all newly discovered cases of rheumatic fever were benefited, because they learned to avoid further exposure to streptococcal infection and subacute bacterial endocarditis after operation or tooth extraction. In addition, many heart patients were more amenable to the techniques of vocational rehabilitation. Similarly, newly discovered cases of hypertensive or arteriosclerotic heart disease with auricular fibrillation, angina pectoris, and marked obesity certainly could be benefited by prompt referral to medical care. There was also a miscellaneous group of cases—congenital syphil-

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itic, thyrotoxic heart disease, and pericardial tumors—that were greatly improved by medical or surgical therapy.

Private Physician Benefited

Such case finding through mass surveys of well people will enable the private physician to see patients in the asymptomatic stages of their disease, when therapy has its greatest effectiveness. Moreover, public health activities in this field will supplement the practicing physician's case finding in his office. This is just one example of the kind of epidemiological work local health departments can conduct successfully.

Priority for Chronic Diseases

The impersonal numbers on the mortality tables cannot convey the tragic stories of human suffering and family disruption that follow in the wake of crippling attacks of heart disease. The magnitude of the problem gives high priority, on the agenda of the health officer, to cardiovascular disease study and control.

Similar epidemiological studies should be undertaken in the field of cancer. Such an enterprise will also demand the active cooperation of the practicing physician and the public health worker.

In attempting to conquer heart disease, cancer, and the other chronic diseases, it is essential that we enlarge the scope of coverage and the number of services which the medical profession and public health agencies can provide. In New York State, we have been for years keenly aware of the necessity of providing medical care for the indigent, and we can boast of the best medical care program for welfare recipients of any State in the Nation.

To make medical care for the indigent even more certain and universal, the New York State departments of welfare and health recently took a significant step forward in cooperative governmental endeavor. The State health department established the new position of assistant commissioner of health (for welfare). One of our key public health administrators was assigned to the Department of Social Welfare to develop and evaluate the medical care program for recipients of public assistance. It is a unique arrangement in government. The new assistant commissioner is responsible to the commissioner of health for professional guidance and has full access to all the information and facilities of the State health department; administratively, he is responsible to the commissioner of social welfare in whose department his office is located.

These medical care programs for more than 3 million persons are locally administered and use the facilities, services, and personnel of both the public and voluntary medical agencies and institutions. Through local hospitals and dispensaries, approximately 850,000 persons receive medical care annually at a cost of $106,000,000. Through local public welfare agencies, 250,000 needy sick persons are cared for at home and in doctors' offices at a yearly expenditure of more than $6,000,000 in public assistance funds. We have an unequaled opportunity to integrate preventive services of health departments into curative services of welfare departments.

Through this interdepartmental cooperation, private physicians, public health and welfare officials, nurses, social workers, rehabilitation specialists, and many others will be working together in an integrated, sustained effort to restore to health and to useful community roles thousands of the diseased and disabled whose impairments have reduced them to economic and social dependency.

It is by means of such cooperative enterprise that we may make a beginning toward the achievement of our high goals. By such realistic teamwork we can conserve efforts, personnel, and funds, and we can measure and surmount the barriers which daily we encounter in our work.

Philosophical Merger Necessary

Public health agencies cannot do these gigantic tasks alone. It will require the cooperative efforts of the whole of society. Particularly will it require a philosophical merger of the policies of medical societies and public health agencies. Clinical medicine is becoming increasingly aware of its role as a social instrument, and public health practice is perceiving

more keenly the problems of the individual in his relation to the family and the community in which he lives and works. But we need a closer working arrangement before we can be effective in controlling heart disease and cancer.

Lest it be feared that by working closely with official public health agencies the medical profession will suffer a loss of freedom, it should be said that complete freedom is not necessarily the natural state of human beings in a crowded society. It is something that can be obtained only within natural limits by continually clearing away obstructions. In seeking freedom in a medical field or profession, it is not enough to say that we want special privilege and the license to do what we like. We must first answer the question, "Freedom for what?"

What we seek is freedom to serve. To be sure, the practicing physician should have every freedom in the exercise of his judgment in the care of his patients. Much of the value of medicine rests on the willingness of sincere physicians to spend unlimited time and effort because they feel responsible for the patient's life and happiness. When this personal feeling is artificial or absent, the work of physicians descends to a low level of effectiveness.

We ought to strive for and insist upon two things that can be coexistent—professional freedom and professional responsibility. Properly viewed, the work of the whole medical profession, which includes public health, is not done in our private interests but in the interest of the community.

With this broad view of professional freedom and responsibility, the private physician and the public health physician can serve the individual and the community to best advantage by working together. They must not be driven by a desire for personal gain alone, but by a willingness to serve the common good. The breadth of this concept emphasizes the scope of action in which all members of the medical profession should participate. Without such a wide horizon, we shall become ingrown and isolated from the dynamic trends of social evolution.

If we are to achieve this common objective of professional cooperation, it is vital that the medical profession, which holds a key position in the social order, close its ranks and that public health and private physicians contribute their full quota to the common effort. We must be prepared, while retaining the best of our traditions, to adjust our efforts to the changing conditions in society.

Medicine changes with time and place, and we must keep abreast of these changes. This will require mutual understanding and faith and trust. The result will be a fuller appreciation on the part of the public health worker of the problems of the general practitioner, plus enlightened awareness on the part of the clinical physician of the responsibilities and special attributes of the public health physician.

We stand at the crossroads. We must take new direction and answer the medical and social questions posed by the chronic diseases as we continue to carry the burdens of our regular work. With courage and with faith in the creative mind of man, we shall succeed.

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Ideas

Ideas need not be unique to be universal. Ideas need not be new to be unique. They need not be dramatic. But they must be useful. Let the readership of Public Health Reports be your sounding board.

—THE EDITORS

Recruiting Aid

VIRGINIA. A practical aid to recruitment of public health nurses has been worked out between the Virginia State Department of Health and the State Highway Department. New employees who do not own cars and are unable to purchase them immediately may have State cars assigned to them for official duty for 6 months. The health department reimburses the highway department on a basis of 4 cents per mile. This provision has proved to be a real asset, since the majority of young graduate nurses are obviously unable or unwilling to take on the financing of a car before they have had a chance to settle down to a new job. Postponing the employment of a much needed nurse because a car is not available has been reduced to a minimum through the plan.

Moreover, if an employee's personal car is out of use because of repair work, a State car may be obtained to cover the period of expected need, a provision which has helped local health departments.

Waiting-Room Reading

DELAWARE. The Delaware Water Pollution Control Commission not only places information in the hands of the people—but also gets them to look at it. Informational literature is sent to doctors, dentists, barber shops, and beauty parlors as waiting-room reading material. Almost everyone at some time or other finds it necessary to kill a little time in one of these establishments. The dog-eared nature of the available literature is tell-tale evidence of the fact that it is perused intensively.

Water Fluoridation Kits

NEW YORK. Many health officers have shown a keen interest in effective ways and means of informing their communities about water fluoridation. The New York State Health Department meets this need with a kit of useful material which includes a pamphlet on fluoridation, suggested news releases, a list of communities which have adopted fluoridation, and a list of equipment and supplies needed by a community in fluoridating its water supplies.

The packet, representing the combined efforts of the health department's bureau of dental health and office of public education, is being distributed to New York State health officers, women's groups, and other interested organizations.

Clinic for Dogs

NEW JERSEY. A clinic to treat and study cancer in dogs has been set up by the Bureau of Biological Research at Rutgers University. Dogs get both benign and malignant tumors, some of which resemble tumors in human beings. The Cancer Clinic for Dogs, where dogs are the patients, may turn up knowledge helpful in treating cancer in man.

All sick dogs are treated free, but the clinic accepts voluntary contributions from dog owners who are interested in expanding research on this particular victim of cancer. Financial assistance was contributed by the Public Health Service, and the Veterinary Medical Association of New Jersey endorsed the organizing of the unique research center.

As soon as the facilities are available, ill dogs will be accepted from other States, but for the time being the clinic accepts its canine patients for treatment only on reference of veterinarians in New Jersey, who have been asked to cooperate in sending suspected or active cases of cancer to the research laboratory for study. One function of the Cancer Clinic for Dogs is its diagnostic assistance to veterinarians—the electroencephalograph it uses will measure electrical waves in the brain, an advanced method of diagnosing damage which few veterinarians could afford.

Dial Once

CLEVELAND, OHIO. One telephone call will locate a health film in Cleveland now—no longer will it be necessary to make four or five calls.

By placing a telephone call to any one of four well-publicized information points, an inquirer can find out whether or not any film on a health topic is available in Cleveland, and where. He can find out other items of interest too: the film's running time; the rental charge if the film is not available for free use; the age level best suited for viewing the film; or the name and address of the producer should he want to purchase the film. The bureau of health education of the Cleveland Division of Health put the new system into effect at the request of the Cleveland Health Council.

Instrument Holder

BROOKLYN, N. Y. Laboratories can easily make a rack to hold inoculating needles, glass rods, pencils, or small laboratory instruments.

The laboratory of the Public Health Service Hospital at Manhattan Beach constructed such a holder by stretching a wire spring across a white enamel metal back.

The holder looks like the familiar kitchen knife holder. It is neat, easy to clean, easy to see, easy to use—especially if conveniently located on a wall near the workbench.

Time is saved by not having to search through drawers for instruments.

Age Aspects of Environmental And Occupational Cancers

By W. C. HUEPER, M.D.

For many years, age factors have played an important and widely accepted role in theories of cancerigenesis (*9*). Curiously enough the concepts advanced in this matter are related to both ends of the age range. Some investigators adhere to Cohnheim's theory that cancers originate from misplaced embryonic cells. Others are followers of the senescence theory of carcinogenesis and believe that cancerigenesis is in some way closely connected with the physiological changes associated with advancing age. The outlook for achieving a reasonable control of cancer by preventive measures would be dark indeed if either theory proved correct or applicable to all or most types of cancers. It is most unlikely that effective measures can be found to prevent the production of the hypothetical ubiquitary embryonic cell misplacements during fetal life. Likewise, there is little prospect of modifying physiological aging processes in such a way that they would lose their alleged carcinogenic properties.

Fortunately, numerous observations made during the last two decades in the fields of environmental and experimental carcinogenesis tend to minimize greatly the significance of primary age influences in the development of malignant tumors and to demonstrate the actual or potential part that exogenous agents assume in bringing about cancerous reactions through a direct or indirect action mechanism (*7*, *9*). A revaluation and redefinition of the role of age in the problem of cancer and especially in its environmental aspects appears to be timely and needed.

Dr. Hueper is chief of the carcinogenic studies section, cancer control branch, National Cancer Institute, National Institutes of Health, Public Health Service. He presented this paper before the Second International Gerontological Congress at St. Louis, Mo., September 1951.

Relationship of Age to Cancer

Although the majority of cancer deaths in the United States and Europe involve individuals between the ages of 30 and 60 years, there is a progressive and steep rise in cancer incidence, if the incidence rate of cancer is expressed in terms of cancers per 10,000 individuals of identical age (*1*, *22*). It is remarkable, however, that the increase in cancer incidence with advancing age is more marked for carcinomas than for sarcomas. Some investigators (*3*) have attempted to reconcile this discrepancy in the age distribution of carcinomas and sarcomas by the hypothesis that connective tissues age faster than epithelial ones. Such a supposition lacks factual support. Observations on experimental and environmental cancerigenesis clearly demonstrate that the histological type of cancer depends upon the tissues to which the cancerigen is applied, or into which it is implanted, or in which it is retained and stored, or for which it possesses a special affinity.

When considering the relationship of age to cancer, there remains the well-established fact that cancers originating from many tissues occur at all ages from the prenatal to the senescence period. Indeed, cancer is the second or

third most frequent cause of death even during the first three decades of life, if deaths from accidents are excluded. Thus among the fatal diseases, cancer ranks high at any age period.

Age Distribution

Additional inconsistencies in the concept of direct age relationships to cancer become apparent when the modal age at death from cancer of different organs is studied (*22*). According to Holtz, incidence maximums for cancers of the testes, kidney, and suprarenal are found at an age range of 0 to 4 years, for tumors of the bones at 15 to 25 years, for cancers of the testes at 30 to 35 years, for cancers of the brain at 40 to 45 years, for cancers of the female sex organs at 50 to 55 years, for cancer of the skin and abdominal organs at 60 to 65 years, and for cancers of the prostate at more than 70 years. Apart from the fact that certain special types of cancers occur almost exclusively during infancy and childhood (Wilms' tumor of kidney, retinoblastoma, botryoid sarcoma of vagina), cancers of some organs have several age peaks of frequency (cancers of the testes, brain, and blood-forming organs).

While melanomas occur at all ages without any special prominence in any particular decade, except that they are rare in young children, they display a different and unique relationship to age inasmuch as there is a precipitous rise in the capacity of melanomas to metastasize after puberty despite their histological similarity to the usual nonmetastasizing juvenile melanoma (*19*).

Regional, Sex, and Race Distribution

There are marked variations in the total cancer incidence as well as in the relative incidence of some organ cancers (skin, lung, mouth, stomach, liver) in the populations of different parts of the world and in different regions of the United States. While some such differences can readily be explained by the considerable variations in the average life span in different countries or by certain racial characteristics, or both, they do not reflect primary biological differences related to age. For instance, there are good reasons to believe that the differences in susceptibility to, and incidence of, cancer of the skin between fair-complexioned and dark-complexioned people are caused by differences in the functional and anatomical qualities of the skin, and that they are not attributable to fundamental variations in some age attributes of the skin of population groups with varying degrees of pigmentation.

Likewise, it is not conceivable that the marked differences in sex distribution of several organ cancers (skin, larynx, lung, bladder, esophagus, lip, tongue, mouth, tonsil, pharynx) represent sex-conditioned variations in the distribution and number of embryonic cell rests or in the time of onset and speed of aging processes of the tissues from which these cancers originate.

The incidence ratio for males and females for cancer of the skin is 4 : 1, for cancer of the lung from 2 : 1 to 20 : 1, for cancer of the larynx 10 : 1, for cancer of the bladder 5 : 1, for cancer of the esophagus 10 : 1. The dilemma in which the protagonists of an age theory of cancer find themselves in this respect is increased by the fact that these ratios are not fixed. They vary in different countries with the changes in environmental conditions, such as the trend toward an equalization or reversal of the sex ratio of cancer of the mouth in India and the Philippines where the chewing of betel nut quids is habitual.

Embryonic Cell Rests and Cancer

The difficulties in attempting to connect age with cancer are accentuated if age concepts are applied to a specific theory, such as Cohnheim's theory. Although some exceptional cancers (Wilms' tumor, and testicular and ovarian teratocarcinomas), usually appearing during the first two to three decades, may be derived from embryonic tissue misplacements, this evidence furnishes little support for the claim that most tumors observed during early life originate from embryonic cell rests (*16*) or are the result of developmental mechanical disturbances (*21*), because the typical cancers of adults produced by exposure to exogenous agents are extremely rare in children.

It is a well-established fact that numerous exogenous chemicals introduced into the body

of a pregnant woman can penetrate the placental barrier and act upon the fetus. Theoretically, thus, it is conceivable that a fetus may become exposed to carcinogenic agents entering the fetal circulation from the maternal side (*9*) and causing cancers during the prenatal or postnatal period. The successful experimental induction of pulmonary tumors in the offspring of mice by a transplacental exposure to urethane administered to the pregnant mouse (*11*) supports this concept.

Senescence and Cancer

The main argument advanced in support of the senescence theory of cancerigenesis is the statistical relationship between advancing age and rise of cancer incidence. The disturbing existence of different age ranges for the peak incidence of cancers of various organs is explained by the proponents of the senescence theory through the introduction of the concept of heterochronic or disharmonic aging of the various organs, while the appearance of cancers during a comparatively early period of life in which senescent processes are not prominent is regarded as the result of local abnormal precocious tissue senescence occurring on the basis of a congenital constitutional predisposition.

Additional support for the senescence theory is sought by claiming that the length of the latent period of cancers induced by exogenous agents in experimental animals bears a direct relationship to their normal life span, that is, the rate of tissue senescence of a particular species controls the speed of cancer development. Wells contended that from one-fifth to one-tenth of the life cycle of an organism ordinarily is required to produce a malignant tumor.

Since most of the cancers occur in individuals who have entered the "senescent" phase of life, it is only natural that in many instances senescent changes are found in coexistence with cancerous reactions. However, many of these "senescent" changes are not physiological but the result of prolonged exposure to exogenous agents, some of which have cancerigenic properties, such as solar radiation, tar, pitch, petroleum derivatives, arsenicals, and ionizing radiation. Spontaneous as well as exogenously induced cancers in man and animals not infrequently develop in a tissue that does not show any so-called "senescent" changes. Pulmonary tumors in mice and aromatic amine cancers in man and dogs illustrate this fact. Finally, cancers are infrequent in certain organs (salpinx, urethra, blood vessels, kidney, testis, heart, bones) at an age period when the atrophying and fibrosing manifestations of advancing age are present.

Latent Period of Cancer

Additional and important evidence against the validity of the senescence theory of cancer is furnished by observations on the latent period of occupational, environmental, and experimental cancers. Willis (*22*) noted that "We now know that cancer is mainly a disease of the elderly, not because senile tissues are 'predisposed' to cancer, as was once supposed, but because of the usually long latent periods elapsing between the application of carcinogenic stimuli and the development of tumors. Occupational and experimental tumors show that these periods often occupy large fractions of the life spans of the affected animals." The validity of this statement is supported by the data in table 1.

The observations from the field of environmental and occupational cancerigenesis not only

Table 1. Latent periods of occupational cancers

Organ and agent	Average latent period	Range of latent period
Skin	*Years*	*Years*
Arsenic:		
Medicinal	18	3–40
Occupational	25	4–46
Tar	20–24	1–50
Creosote oil	25	15–40
Mineral oil	50–54	4–75
Crude paraffin oil	15–18	3–35
Solar radiation	20–30	15–40
X-radiation	7	1–12
Lung		
Asbestos	18	15–21
Chromates	15	5–47
Nickel carbonyl	22	6–30
Tar fumes	16	9–23
Ionizing radiation	25–35	7–50
Bladder		
Aromatic amines	11–15	2–40

demonstrate that the basic cancerization process antedates often by many years the time at which the cancer becomes manifest, but they also show that the age at onset of exposure and the intensity of contact with the carcinogenic agent determine the manifestation age.

When children from 4 to 10 years old entered the profession of sweeps in England during the early part of the last century, chimney sweeps developed scrotal cancer at an average age of 30 to 40 years (*5*). After this practice was discouraged by law and sweeps did not start in the trade before the age of 16, the average age at which scrotal cancer in sweeps was observed rose to from 45 to 50 years at the end of the nineteenth century (*4*). With the subsequent introduction of improved hygienic conditions and technical procedures reducing the intensity of exposure to soot, the average age of sweeps with scrotal cancer increased to 61.9 years by 1935 (*8*). The evidence clearly shows that the progressive and considerable increase in the average age of sweeps with scrotal cancer was directly dependent upon the later onset of exposure and on a reduction in the intensity of exposure (*12*). While sweeps still have a higher liability to scrotal cancer than the general population, the average manifestation age of scrotal cancer in sweeps is now identical with that of scrotal cancers of unknown etiology (table 2).

Table 2. Age distribution of scrotal cancer in chimney sweeps

Years	1892[1] (cases)	1935[2] (cases)
25–35	4	1
36–45	7	6
46–55	14	18
56–65	4	33
66–75		28
76–85		17
Average age	45–50	61.9

[1] Butlin (*4*). [2] Henry (*8*).

A similar effect of the age at onset and of the intensity and the duration of exposure to an environmental carcinogenic agent upon the average manifestation age of the resulting cancers is evident in arsenical cancers of the skin. While the average age of skin cancer patients is about 60 years (*14*), approximately one-third of 115 medicinal arsenical cancers were seen in patients less than 40 years old, and more than 60 percent were not older than 50 years (*13*). Likewise, the average age of persons with occupational X-ray cancer of the skin is in the age group 41–66 years (*9*). Occupational cancer of the bladder of chemical or parasitic origin also is characterized by an age incidence which favors the younger age groups below 50 years of age (aromatic amine cancer: 52.8 percent of all cases in individuals less than 50 years old; schistosomiasis cancer: mainly in individuals 30 to 40 years old), contrasted with an age distribution of more than 50 years for 65 percent of all cryptogenetic bladder cancers.

The evidence presented in table 3 shows a shift into younger age groups for skin cancers caused by arsenicals, pitch, paraffin oil, shale oil, and X-radiation, for cancer of the lung induced by tar and ionizing radiation, and for cancers of the bladder produced by betanaphthylamine and benzidine.

Observations made in experimental carcinogenesis also demonstrate beyond any doubt that the length of the latent period and, thereby, the manifestation age is not dependent upon any senescent changes or on the average life span of a species, but on the intensity of exposure to a carcinogen and to the specific potency of a carcinogen for the particular species. Numerous investigators have shown that young animals react to carcinogenic hydrocarbons as readily as, if not more readily than, adult animals (*2, 17, 20, 23*).

Rusch and Baumann noted that the latent period of ultraviolet-ray cancer in mice was 3.5 months if the daily period of exposure was 60 minutes. It was increased to 9 months when the exposure period was reduced to 10 minutes. Rabbits and guinea pigs, on the other hand, have proved refractory to the carcinogenic action of ultraviolet rays. The latent period of bladder cancer in dogs fed betanaphthylamine daily is from 18 to 24 months, while it rises to 5 years if the feeding of the chemical is discontinued after 6 months. Fieser and co-workers (*6*) found that the average latent period of skin cancer in mice varied with different carcinogenic hydrocarbons. It was 2.5 months

for methylcholanthrene, 3.5 months for 3,4 benzpyrene, and 7 months for 1,2,5,6 dibenzanthracene when these chemicals were tested under standardized conditions. Hueper observed that hairless rats, which have a normal life span of about 360 days and a markedly keratotic skin, were definitely less susceptible to the carcinogenic action of ultraviolet rays than normal albino rats having an average life span of 555 days, while both strains were refractory to methylcholanthrene in a benzolic solution applied to the skin.

Additional evidence militating against the fundamental importance of age factors in the production of many human cancers is provided by observations on the epidemiology of penile cancer. The large-scale Jewish experience with circumcision on the eighth day of life indicates this procedure affords complete protection against a subsequent development of penile cancer, and the studies of Schrek and Lenowitz (*15*) on circumcised American white persons and Negroes suggest that circumcision performed during the first 6 years has a similar protective effect. Circumcision at a later age (6 to 35 years), on the other hand, does not result in any significant difference in the incidence of penile cancer between circumcised and noncircumcised individuals. Since the interval between circumcision and the appearance of penile cancer ranges from 8 to 40 years with an average interval of 23 years (*10*), it is evident that the specific cancerigenic exposure in penile cancer apparently takes place during the first 10 to 15 years of life.

The high death rate of cancer of the lung among miners of radioactive ores, which stands at some 70 percent of all deaths for the Schneeberg miners and at some 40 percent for the Joachimsthal miners, cannot be attributed to the existence of a "preferential" type of aging among these population groups. The progressive rise in the incidence of pitch warts and cancers among English pitch workers from 17 percent of the workers after 1 to 5 years of exposure to 100 percent after more than 40 years of exposure (*18*) provides an additional illustration of the lack of importance of senescent changes in the causation of occupational cancers.

Table 3. Age distribution of occupational cancers

Organ and agent	10–30		31–40		41–50		51–60		61–70		71 and over		Total number
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	
Skin													
Arsenic	10	8.7	28	24.3	35	30.4	24	20.9	17	14.8	1	0.9	115
Pitch	6	5.1	14	12.2	34	29.6	38	33.1	20	17.3	3	2.7	115
Tar	------	------	6	7.5	14	17.5	15	18.7	32	40.0	18	16.2	80
Paraffin	------	------	6	5.9	30	28.8	38	34.8	29	27.6	3	2.9	106
Shale oil	------	------	12	17.8	22	32.3	23	33.8	6	8.9	5	7.3	68
Solar radiation	2	.9	8	3.6	24	10.7	58	25.8	76	33.8	56	25.0	224
X-radiation	------	------	18	51.4	9	26.1	6	17.1	0	0.0	1	2.9	35
Control	13	1.8	74	10.4	125	17.6	165	23.2	174	24.5	157	22.2	709
Lung													
Asbestos	------	------	2	11.8	7	41.2	6	35.3	1	6.0	1	6.0	17
Chromate	1	1.0	11	11.0	22	22.0	34	34.0	21	21.0	1	1.0	100
Tar	------	------	7	33.3	12	57.1	1	4.8	1	4.8	------	------	21
Ionizing radiation	6	5.3	30	26.7	38	33.6	29	25.7	10	8.7	------	------	113
Control	99	5.8	222	12.2	444	24.5	609	33.6	356	19.6	62	3.4	1,792
Bladder													
Aromatic amine	8	3.8	40	19.0	63	30.0	81	38.6	17	8.1	1	.5	210
Control	2	.8	21	8.1	59	22.7	85	32.8	63	24.2	29	9.4	259

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Conclusions

Numerous observations made in connection with cancers in general as well as especially with environmental and occupational cancers indicate that neither embryonic cell rests nor senescing tissues play an important or essential role in the development of malignant neoplasms.

Against the existence of causal and direct age relationships to cancerigenesis the following facts may be cited:

1. Only carcinomas but not sarcomas exhibit an incidence rate that significantly increases with age.

2. Cancers of different organs have widely varying age peaks covering the entire life span. Several organ cancers have two or even three distinct age peaks.

3. The distribution of cancers by sex, race, and regions displays a pattern that cannot be reconciled with a uniformly operating age factor.

4. The well-established occurrence of occupational cancers during childhood, the experimental transplacental induction of lung tumors in mice, and the consistent development of occupational and experimental cancers by exogenous carcinogens at predeterminable sites and after predictable periods of exposure strongly indicate that embryonic cell rests account for only the exceptional cancer and that senescent tissue changes are unimportant.

5. Many of the so-called senescent changes in tissues allegedly providing the prepared soil for cancer represent the result of prolonged exposures to specific environmental or occupational cancerigenic factors.

6. Numerous observations on environmental, occupational, and experimental cancerigenesis prove that a long latent or preparatory period precedes the appearance of cancers following an effective exposure to a carcinogenic agent. It is mainly for this reason that the majority of such cancers are observed during the later part of life.

7. The validity of this concept is supported by the fact that the length of the latent period is dependent upon the intensity and duration of exposure to a carcinogenic agent and to its relative carcinogenic potency.

8. The manifestation age of environmental and occupational cancers is directly related to the age at onset of the cancerigenic exposure.

9. The excessive frequency of cancers of certain organs among members of special professions and occupations also suggests that factors other than physiological aging are responsible for the causation of these neoplasms.

The evidence presented supports the view that cancer development in organs or tissues having early, frequent, and prolonged contact with exogenous agents is in most instances not directly or indirectly related to age factors. It appears possible, however, that organ cancers, which may be the result of functional or hormonal disturbances, may, in part, be dependent in their genesis on the action of age factors, because changes in the internal environment associated with and resulting from organic functional impairments and imbalances occur with advancing age.

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Dr. Knutson Appointed Chief Dental Officer

Dr. John W. Knutson was named the new chief dental officer of the Public Health Service by Surgeon General Leonard A. Scheele early in June. Chief of the Division of Dental Public Health until then, Dr. Knutson succeeded Dr. Bruce D. Forsyth on the latter's conclusion of a 4-year tour of duty as chief dental officer.

A member of the commissioned corps of the Public Health Service since 1934, Dr. Forsyth has been assigned to Federal Security Agency Region I in Boston as regional dental officer for the Public Health Service. In his new capacity, Dr. Forsyth will act as dental consultant for the New England area.

Also a commissioned officer since 1934, Dr. Knutson joined the Public Health Service in 1931. He served as dental clinician at Public Health Service hospitals in Chicago, and Norfolk, Va., during his early career. From 1938 to 1940, Dr. Knutson was assigned to the National Institutes of Health, Public Health Service, to conduct research in dental caries. For the next 4 years, he conducted demonstration studies and laboratory research in dental health at the Minnesota State Department of Health. He became chief of the dental section, State Relations Division of the Bureau of State Services, in 1944, where he acted as dental consultant to State health authorities until his appointment as chief of the Division of Dental Public Health in 1949.

Dr. Knutson's predecessor, Dr. Forsyth, served as chief dental officer at various Public Health Service posts between 1934 and 1948, including the U. S. Reformatory at El Reno, Okla., and Public Health Service hospitals and clinics in New York, Fort Worth, Tex., and Washington, D. C.

Voluntary Reporting of Venereal Diseases

—*In Contacts Previously Reported Not Infected*—

By BENSON H. SKLAR, M.Sc.P.H., LEONARD M. SCHUMAN, M.D., M.Sc., and NORMAN J. ROSE, M.D., M.P.H.

A central registry of venereal disease cases and contacts was established in 1944 in the Illinois Department of Public Health to eliminate duplication of reporting and to provide a screening device for laboratory positives, field assignments, and correspondence. All information pertinent to the case or contact is coded on punch cards and filed alphabetically with this registry. A duplicate set of cards containing morbidity data is kept for background.

Records in this central registry show that some individuals are reported repeatedly for clinical progression in the course of syphilis, as new infections of syphilis, and as new infections of gonorrhea. This information, when filed in a central registry, provides an instrument which lends itself to analysis of administrative procedures. It is also proposed to use this method to determine whether contacts to primary or secondary syphilis cases who had been found upon initial examination to be not infected would, because of their presumed promiscuity, be reported subsequently as new cases of venereal disease. With the results of such a study in mind, efforts might be directed toward subsequent programs to follow up these contacts to primary and secondary syphilis cases, in an effort to find new cases of venereal disease.

Such a study suggests two avenues of approach: (*a*) a check of the central registry to determine voluntary reporting of such contacts as cases by private physicians or clinics, and (*b*) an actual field demonstration on contacts found previously noninfected. This paper is based upon the first method.

The authors are with the Illinois Department of Public Health: Mr. Sklar is executive officer of the office of procedures and reports, division of preventive medicine; Dr. Schuman, deputy director of that division; and Dr. Rose, chief of the bureau of epidemiology.

Method

Since the establishment of an assignment and report form in 1944, all information on each case followed as a field assignment is recorded on a punch card, making possible the tabulation in the central registry of results and other pertinent data on venereal disease investigations. For this study, all reports of contact investigations in which information was available on contacts to primary and secondary syphilis cases were sorted from the file. The reports which indicated that the contact was not infected when examined were used in this study. A list of such contacts to primary and secondary syphilis cases who were found upon investigation to be not infected was established for each year from 1946 through 1950. Records on these contacts, giving pertinent information, such as age, sex, color, and county of residence, were filed alphabetically. The records were then checked against the central registry files for any diagnostic and treatment data available there. In some cases, central registry information represented data obtained

prior to completion of the original investigation; in most cases, after the completion of the original investigation.

Results

Tables 1 and 2 indicate the results of a check of contact listings with the central registry. This screening was made during May 1951, and represents a 5-year check of contacts originally reported not infected, to determine if they eventually were reported by private physicians or clinics as cases of venereal disease. The central registry was used to screen this list of contacts for diagnostic and treatment data. The records of 1,935 contacts found not infected on initial investigation yielded morbidity information on 266, or 13.7 percent; 198, or 10.2 percent, were found infected sometime after the conclusion of the initial examination; and 68, or 3.5 percent, were found to have been infected with a venereal disease prior to the date of investigation. Of the 198 contacts found infected with a venereal disease in the ensuing 5 years of this study, 90, or 45.5 percent, were reported as cases of syphilis, while 108, or 54.5 percent, were reported subsequently as cases of gonorrhea. The 90 syphilis cases represent 4.6 percent of the noninfected contacts subsequently reported, with 53 of these, 59 percent, in the primary or secondary stage, while the 108 gonorrhea cases represent 5.6 percent of the original screened contacts. A decreasing trend in the ratio of reporting new cases of venereal disease to the numbers screened each year is noted in this study. In 1946, 12.4 percent of these contacts were subsequently reported as cases, while in 1950 only 5.2 percent were found to be infected with a venereal disease.

Table 1 shows that 68 of these contacts were reported as cases of venereal disease sometime before their investigation as contacts. This case information relating to such contacts was brought to light by correspondence, recent morbidity reports, and by other means. Of the 68 contacts reported as infected before the initiation of such investigation, 29, or 42.6 percent, of the infections were syphilitic, while 39, or 57.4 percent, were gonorrheal.

Table 3 summarizes the results of such a screening procedure. The highest percentage of venereal disease among contacts was found to have been contracted during the first year after the examination at which the contact had been reported to be not infected. A decreasing trend in these percentages is apparent for these noninfected contacts for the next 4 years. The majority of the first-year-interval reports are for primary or secondary syphilis.

Discussion

This study indicates that of the 1,935 contacts checked, 90, or 4.6 percent, were subsequently re-

Table 1. Results of central registry screening of noninfected contacts, by year of investigation—down-state Illinois, 1946–50

Year	Contacts found not infected on initial investigation (number)	Contacts found infected after initial investigation					Contacts found infected prior to initial investigation				
		Total venereal disease		Syphilis		Gonorrhea (number)	Total venereal disease		Syphilis		Gonorrhea (number)
		Number	Percent	Primary and secondary (number)	Other syphilis (number)		Number	Percent	Primary and secondary (number)	Other syphilis (number)	
1946	460	57	12.4	18	8	31	13	2.8	2	0	11
1947	469	58	12.4	13	17	28	12	2.6	4	1	7
1948	428	41	9.6	9	6	26	16	3.7	8	0	8
1949	309	28	9.1	5	6	17	5	1.6	1	1	3
1950	269	14	5.2	8	0	6	22	8.2	8	4	10
Total	1,935	198	10.2	53	37	108	68	3.5	23	6	39

Table 3. Noninfected contacts later reported as venereal disease cases by interval of time between

Table 2. Number and percent of cases of venereal disease reported among noninfected contacts, by year reported as a case and by year found not infected as a contact

Year reported as case	Year found not infected as contact									
	1946		1947		1948		1949		1950	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1946	27	5.9								
1947	14	3.0	22	4.7						
1948	7	1.5	16	3.4	13	3.0				
1949	5	1.1	9	2.0	20	4.7	14	4.6		
1950	4	.9	11	2.3	8	1.9	14	4.5	14	5.2
Total infected contacts	57	12.4	58	12.4	41	9.6	28	9.1	14	5.2
Total noninfected contacts	460		469		428		309		269	

ported as cases of syphilis. Of the syphilis cases found, 59 percent were diagnosed as being in the primary and secondary stages. It is interesting to note that most of these infectious cases were diagnosed during the first year after they were examined as contacts and found to be not infected. In order to determine whether any of these infectious cases were missed during their initial investigation and examination as contacts, a sample survey of similar assignments indicated that the notation "examined not infected" was entered on these investigation reports at varying lengths of time after the exposure date—70 percent were followed for 90 or more days; 20 percent, 60 to 90 days; and 10 percent less than 60 days. If this sample is acceptable as representative of the whole experience, the number of contacts subsequently reported as infected, and probably by the same initial exposure, would be insignificant. It must be remembered that 10 percent of the cases were followed less than 60 days—an interval well above the average incubation period for the disease. This, however, does not minimize the need for adequate follow-up of such contacts.

The percent of cases (4.6) subsequently reported among contacts initially found noninfected is deemed to be significant in view of the fact that these were spontaneously reported without added follow-up incentive. Compared to the rate of voluntary reporting of new cases among the population at large, this group of contacts, who have been at risk and may continue to be at risk because of established promiscuity, constitutes a reservoir of new cases toward which case-finding efforts might be directed. The statistics which in recent years have pointed out the magnitude of undiagnosed, and hence unreported, cases tempt the inference that many more new cases could be elicited by re-examining the "noninfected-contact" reservoir, for in it there may well be many subsequent exposures. Certainly, serologic surveys are not selective of such groups but are applied to the general adult population at great cost and extremely low yields of early infectious cases.

The decreasing trend in the ratio of new cases of venereal disease reported to the numbers screened each year is shown in table 2. With prolongation of time for presumed promiscuity, when all other factors are constant, increased cumulative exposure, and hence increased infection and subsequent higher incidence of voluntary reporting are expected. Certain factors which qualify these assumptions are: (*a*) the increased incidence of venereal disease during war periods, and (*b*) the present decreasing incidence of reported new infections of venereal disease. In this 5-year study, representing a period of national emergency after the termination of World War II, the reported infection rate of syphilis rose and then declined precipitously. During the peak years of infectivity, increased promiscuity probably yielded increased morbidity because of increased exposure

Table 3. Noninfected contacts later reported as venereal disease cases by interval of time between contact investigation and report as a case

Interval between contact investigation and report of contact as a case (years)	Total contacts for each period	Total venereal disease		Syphilis						Gonorrhea	
				Total		Primary and secondary		Other			
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Under 1	1,935	86	4.4	47	2.4	37	1.9	10	0.5	39	2.0
1–1.9	1,666	66	4.0	27	1.7	11	.7	16	1.0	39	2.3
2–2.9	1,357	24	1.8	9	.7	4	.3	5	.4	15	1.1
3–3.9	929	16	1.7	4	.4	0	0	4	.4	12	1.3
4–4.9	460	6	1.3	3	.6	1	.2	2	.4	3	.7

risk, while during the years of decreasing infectivity, promiscuity may not have yielded similar increased mobidity because of the lessening of this risk.

The entire yield of the investigation of contacts to infectious cases of syphilis who were found not infected on their initial examinations will be determined not only from spontaneous reporting of such contacts as new cases of venereal disease, but also from a careful field investigation of such contacts who were not spontaneously reported. It can, however, be noted from results of this study that a follow-up of a presumed promiscuous population may be worthy of administrative trial, inasmuch as cases reported voluntarily represent only those who seek medical care from physicians who may not report them to a health department. Such an approach is now in operation on a demonstration and research basis and will be reported later.

Summary and Conclusions

1. Of 1,935 contacts reported after investigation as noninfected, 266, or 13.7 percent, were subsequently reported as having become infected with syphilis or gonorrhea. Of these, 198, or 10.2 percent, of the contacts initially investigated were found infected sometime after the conclusion of the initial investigation.

2. Syphilis cases reported in this group totaled 90, or 4.6 percent, of all noninfected contacts.

3. Early infectious (primary and secondary) syphilis totaled 53 cases, or 58.9 percent of all cases of syphilis subsequently reported.

4. The majority of all venereal disease cases subsequently reported among such "noninfected" contacts were reported within 1 year after the initial investigation.

5. The spontaneity of this reporting is emphasized and inferences drawn as to yield after re-examination of the noninfected-contact reservoir.

6. Voluntary reporting of venereal diseases by reporting agencies to the venereal disease central registry in the Illinois Department of Public Health has been utilized in this study to pinpoint administratively the need for further control measures in the follow-up of contacts to primary and secondary cases of syphilis, who, upon their initial examination and investigation, were found to be not infected with a venereal disease.

Dietary Standards in the United States

By L. A. MAYNARD, Ph.D.

The dietary standards in general use by Government agencies and food and nutrition scientists throughout the United States are the recommended dietary allowances formulated by the Food and Nutrition Board of the National Research Council. These dietary allowances, revised in October 1948, are presented in the accompanying table (*1*).

Normal Food Supply Situations

The dietary allowances specify levels which the Food and Nutrition Board recommends as "normally desirable goals or objectives" in dietary practice. The allowances for the different nutrients are generally higher than those found in other promulgated standards because they are intended to represent not merely average requirements, but "levels enough higher to cover substantially all of the individual variations in the requirements of normal people." Many individuals would thus receive intakes above their needs, but there seems to be no way of identifying persons whose requirements are markedly above the average, and the board has no evidence that any individual would be harmed by consuming the full nutrient allowances specified.

All of the allowances are intended to represent intakes actually consumed. As is to be expected in the present state of our knowledge, the data represent some compromises of the views of those qualified to express an opinion with respect to a given nutrient. Nevertheless, the table as a whole has won widespread acceptance. None of the values, however, are considered final. A committee of the board is constantly examining new data as they appear and reevaluating the old, with the objective of making needed modifications. It is also reviewing previously and currently published studies to provide data for nutrients not now included in the table. The data and viewpoints set forth in the reports of the United Kingdom and of Canada, published since the last revision of the recommended dietary allowances, are among the studies being given consideration by the committee.

The experimental bases and other considerations which led to the formulation of the present recommended dietary allowances are set forth in considerable detail by the National Research Council (*1*). A few explanatory statements regarding certain values are given here.

Calories

In contrast to the situation with respect to nutrients, there are definite reasons why unneeded intakes of calories should be avoided by adults. It is simple to state that each person

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Dr. Maynard is chairman of the Food and Nutrition Board, National Research Council, and director of the School of Nutrition at Cornell University, Ithaca, N. Y. *This paper is based on material presented before the scientific session of the Combined Conference on Administrative and Scientific Aspects of Food in Civil Defense held in London, November 26 to December 3, 1951 (see Public Health Reports, July 1952, p. 607).*

should consume enough calories, and no more, to maintain his ideal weight, but setting up a workable standard which will actually accomplish this for the individual is quite another matter. Age, sex, body build, genetic make-up, physical activity, and climate all have an influence on the requirements.

The board's calorie allowances take into ac-

Recommended daily dietary allowances, revised 1948 [1]

[Food and Nutrition Board, National Research Council]

Classifications	Calories [2]	Protein (gm.)	Calcium (gm.)	Iron (mg.)	Vitamin A [3] (I. U.)	Thiamine [4] (mg.)	Riboflavin [4] (mg.)	Niacin (nicotinic acid) [4] (mg.)	Ascorbic acid (mg.)	Vitamin D (I. U.)
Man (154 lb., 70 kg.):										
Sedentary	2,400	70	1.0	[5] 12	5,000	1.2	1.8	12	75	([6])
Physically active	3,000	70	1.0	[5] 12	5,000	1.5	1.8	15	75	([6])
With heavy work	4,500	70	1.0	[5] 12	5,000	1.8	1.8	18	75	([6])
Woman (123 lb., 56 kg.):										
Sedentary	2,000	60	1.0	12	5,000	1.0	1.5	10	70	([6])
Moderately active	2,400	60	1.0	12	5,000	1.2	1.5	12	70	([6])
Very active	3,000	60	1.0	12	5,000	1.5	1.5	15	70	([6])
Pregnancy (latter half)	[7] 2,400	85	1.5	15	6,000	1.5	2.5	15	100	400
Lactation	3,000	100	2.0	15	8,000	1.5	3.0	15	150	400
Children up to 12 years: [8]										
Under 1 [9]	[10] 110	[10] 3.5	1.0	6	1,500	.4	.6	4	30	400
1–3 (27 lb., 12 kg.)	1,200	40	1.0	7	2,000	.6	.9	6	35	400
4–6 (42 lb., 19 kg.)	1,600	50	1.0	8	2,500	.8	1.2	8	50	400
7–9 (58 lb., 26 kg.)	2,000	60	1.0	10	3,500	1.0	1.5	10	60	400
10–12 (78 lb., 35 kg.)	2,500	70	1.2	12	4,500	1.2	1.8	12	75	400
Girls over 12 years: [8]										
13–15 (108 lb., 49 kg.)	2,600	80	1.3	15	5,000	1.3	2.0	13	80	400
16–20 (122 lb., 55 kg.)	2,400	75	1.0	15	5,000	1.2	1.8	12	80	400
Boys over 12 years: [8]										
13–15 (108 lb., 49 kg.)	3,200	85	1.4	15	5,000	1.5	2.0	15	90	400
16–20 (141 lb., 64 kg.)	3,800	100	1.4	15	6,000	1.7	2.5	17	100	400

[1] Objectives toward which to aim in planning practical dietaries: The recommended allowances can be attained with a good variety of common foods which will also provide other minerals and vitamins for which requirements are less well known.

[2] Calorie allowances must be adjusted up or down to meet specific needs. The calorie values in the table are therefore not applicable to all individuals but rather represent group averages. The proper calorie allowance will maintain, over an extended period, body weight or rate of growth at the level most conducive to well-being.

[3] The allowance depends on the relative amounts of vitamin A and carotene. The allowances of the table are based on the premise that approximately two-thirds of the vitamin A value of the average diet in this country is contributed by carotene and that carotene has half or less than half the value of vitamin A.

[4] For adults (except pregnant and lactating women) receiving diets supplying 2,000 calories or less, such as reducing diets, the allowances of thiamine and niacin may be 1 mg. and 10 mg., respectively. The fact that figures are given for different calorie levels for thiamine and niacin does not imply that we can estimate the requirement of these factors within 500 calories, but they are added merely for simplicity of calculation. In the present revision, riboflavin allowances are based on body weight rather than calorie levels. Other members of the B complex also are required, though no values can be given. Foods supplying adequate thiamine, riboflavin, and niacin will tend to supply sufficient amounts of the remaining B vitamins.

[5] There is evidence that the male adult needs relatively little iron. The need will usually be provided for if the diet is satisfactory in other respects.

[6] The need for supplemental vitamin D by vigorous adults leading a normal life seems to be minimum. For persons working at night and for nuns and others whose habits shield them from the sunlight, as well as for elderly persons, the ingestion of small amounts of vitamin D is desirable.

[7] During the latter part of pregnancy the calorie allowance should increase to approximately 20 percent above the preceding level. The value of 2,400 calories represents the allowance for pregnant, sedentary women.

[8] Allowances for children are based on the needs for the middle year in each group (as 2, 5, 8, etc.) and are for moderate activity and for average weight at the middle year of the age group.

[9] Needs for infants increase from month to month with size and activity. The amounts given are for approximately 6 to 8 months. The dietary requirements for some of the nutrients such as protein and calcium are less if derived largely from human milk.

[10] Amount required for 2.2 lb. (1 kg.) of body weight.

count sex differences and three categories of activity. The limitations involved in the use of these three categories are fully appreciated, but they cannot be overcome simply by adding more categories. The problem remains of so defining the categories selected as to permit the classification of a population accordingly. Although data are available for caloric expenditures in various types of work, the variable expenditures of individuals during nonworking hours or at tasks not covered by their regular work seem impossible to classify. In view of the variables not taken into account in the general recommendation, the board suggests that its calorie allowances be regarded as subject to modification of plus or minus 15 to 20 percent, according to conditions.

The need for more precise statements of calorie allowances is recognized, both because they are obviously dominant factors in the total food supply needed, and also because of the deleterious effects of an excess in the adult. Committees of the board are giving active consideration to the issues involved.

Calcium

The present adult allowance of calcium is 20 percent higher than the board's previous recommendation. Data obtained in the United States reveal a wide range in the calcium intake required by adults to maintain calcium equilibrium. For some, as little as 0.3 mg. daily appears to suffice, whereas at the other extreme some individuals, particularly elderly people, seem to require even more than 1 gm. daily. Although the average need is manifestly much less than 1 gm., the board felt that this figure was in keeping with the policy of setting the allowance high enough to meet the needs of all normal individuals. Recognition was also given to the evidence from experiments with rats that liberal intakes of calcium promote longevity.

Vitamin C

Although the board recognizes that the physical symptoms of scurvy can be prevented and even cured by much less vitamin C than specified in its allowances, the accumulating evidence regarding the variety of metabolic roles which the vitamin plays and the rapid depletion of body stores during stress has indicated the desirability of maintaining a liberal supply in the blood and other tissues. The allowances have been placed accordingly.

Vitamin A Value

The content of vitamin A itself and of its precursor carotene together account for the vitamin A value of a dietary. The allowances given in the table for vitamin A are based on the premise that a unit of carotene has one-half the value of a unit of vitamin A per se and that in the average American diet two-thirds of the vitamin A value is supplied by carotene. The limitations and uncertainties of these bases, particularly in terms of specific foods and diets, are recognized.

Emergency Food Supply Situations

In answer to requests for suggestions which may aid State and local civil defense agencies in formulating plans for emergency feeding of uninjured civilians, the Committee on Dietary Allowances of the board has prepared a brief report. This report points out that it is unrealistic to expect to provide adequate diets or to designate specific nutritional requirements for any large population in emergencies following an atomic attack. It states that provision of foods to supply energy needs should suffice for the first few days of an emergency, especially if foods which supply protein and other nutrients, as well as calories, are selected.

According to the report, "drastic reduction of food intake for a few days, or even weeks, is tolerated reasonably well except by infants, by lactating women, by the sick and injured, and by those engaged in heavy physical work. This is particularly true if the calories that are available come largely from foods that furnish a variety of nutrients such as bread, potatoes, and milk, in contrast to foods such as sugar, syrups, and oils, which supply calories primarily." For periods of food shortage lasting longer than a few weeks, the report adds, special provision must be made for supplying foods not only for the more vulnerable groups, but also for pregnant women.

As the period of emergency is prolonged, the need for certain individual nutrients increases.

The report states: "If the emergency feeding must be continued for more than a few weeks, the problem of individual nutrients, as well as calories, assumes importance. Cognizance must be taken of needs for protein, thiamine, other B-complex vitamins, and ascorbic acid." Deficiencies of minerals and fat soluble vitamins are not likely to occur, however, unless food shortages persist over several months.

The report stresses the importance of nutritional appraisal of the population by trained survey teams as a part of any emergency program. Such an appraisal will detect any deleterious effects of the food allowance on health and will serve as a basis for further dietary planning.

In regard to use of foods on hand during an atomic explosion, the report points out that food present in closed containers is usually safe if the outside of the container is washed. Food in open or broken containers exposed to radioactive materials should, however, be monitored before use. The report cautions against wasting food because of the possibility of contamination by atomic radiation.

The recommendations of this report, though much less detailed, are in general accord with those set forth by the Federal Civil Defense Administration (*2*).

REFERENCES

(*1*) National Research Council, Food and Nutrition Board: Recommended dietary allowances. Washington, D. C., National Research Council, 1948. Reprint and Circular Series, No. 129.

(*2*) U. S. Federal Civil Defense administration: Health services and special weapons defense. Washington, D. C., U. S. Government Printing Office, 1950. Manual AG–11–1, pp. 144–150.

PHS films

Sanitary Storage and Collection of Refuse

16 mm., sound, color, 19 minutes, 1952.

Audience: Public health and sanitation personnel.

Available: Loan—Communicable Disease Center, Public Health Service, Box 185, Chamblee, Ga. Purchase—Castle Film Division, United World Films, 1445 Park Avenue, New York 29, N. Y.

Operations essential in the sanitary handling, storage, and collection of refuse from homes, restaurants, and business establishments are depicted by this film, produced by the Audio Visual Production Branch of the Communicable Disease Center, Public Health Service, in cooperation with the Public Health Service, Division of Sanitation.

The film is of particular interest to Public Health Service personnel—sanitary engineers, sanitarians, and health officers—and can be used by them in working with municipal officials and local sanitation department employees. Refuse, the film points out, consists of both garbage and rubbish. Unless disposed of promptly, refuse furnishes harborage to rodents, flies, and mosquitoes. Local government agencies are encouraged to inform the individual property owner and restaurant operator how to store refuse properly to fit in with good community collection and disposal practices. Garbage may be separated from rubbish for disposal in grinders or to hog

farms, or the two may be combined for disposal in sanitary land fills or in modern predrying kiln process incinerators. In either case, the individual is responsible for sanitary storage of refuse on his own premises. He should wrap all garbage and place it in heavy metal, tight-lidded, conveniently located garbage cans.

The film illustrates several devices, such as cloth collection squares, to protect the citizen's cans and to make the loading of garbage into the truck easier. It emphasizes that planned collection routes, properly designed trucks, and courteous service by sanitation department employees pay off in health and efficiency.

Family Food Consumption Studies

By C. M. COONS, Ph.D.

It is a comfort to know that the Nation's supply of food appears to be sufficient in kind and amount, with some margins of safety, to meet the dietary requirements of its military and civilian populations. But it may be cause for concern and action to find that many families have poor diets under conditions of ample national supplies.

A major objective of family food consumption studies is to learn about socioeconomic and other conditions associated with low and high levels of food consumption and to study the importance of some of the factors affecting the nutritive adequacy of diets.

National Food Surveys

The most recent national survey of family food consumption was that of urban families in the spring of 1948 (*1*, *2*). Also, in 1948 and 1949, seasonal data were collected in four cities (Birmingham, Buffalo, Minneapolis-St. Paul, and San Francisco) representing different sections of the United States (*3*, *4*).

For comparisons, consumption data were obtained in 1950 from a small sample of rural families in the Minnesota area (*5*). About the same time, five southern States, cooperating with the Bureau of Human Nutrition and Home Economics, completed a joint survey of farm family food consumption in the cotton, tobacco, and mountain areas of the South (*6*). Data from national samples of both urban and rural families are available for 1942 (*7*). The largest survey of food consumption on a nation-wide basis was made in 1936 (*8*, *9*).

The 1936, 1942, and 1948 studies were made during different economic cycles in this country. The first was near the end of the depression of the 1930's. The second was on the eve of rationing in World War II. The 1948 studies were conducted during a war recovery period of high level food consumption in the country as a whole.

For these studies, random samples of families reported to trained interviewers the quantities of food purchased, home-produced, or otherwise acquired, and consumed within a specified period, usually a week. Enough details were given as to the kind, form, quality of the food, and composition of the household to make possible computations of nutritive value, comparisons with recommended allowances for dietary adequacy, and analyses of variations in consumption. The analyses were designed to show the levels of consumption by different socioeconomic classifications of the families, to identify the low-consuming groups, and to reveal the effect of low consumption of important foods on the adequacy of diets.

Comparisons of Food Consumed

Selected data from some of the analyses of food quantities consumed as reported in the

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Dr. Coons, assistant chief of the Bureau of Human Nutrition and Home Economics of the United States Department of Agriculture, *adapted the material for this paper in part from one presented at the Combined Conference on Administrative and Scientific Aspects of Food in Civil Defense, held in London, November 26 to December 13, 1951 (see Public Health Reports, July 1952, p. 607). Most of the data are taken from studies conducted by the Bureau of Human Nutrition and Home Economics.*

1948 surveys are summarized in table 1. The first two lines of the table show the average national supply at retail for all consuming groups for the entire year of 1948 (*10*) in comparison with the quantities of food groups urban families consumed in the spring of 1948. Some differences would be expected from the nature of the two types of data. Citrus fruits, for example, were used in larger quantities by urban than by rural families, and grain products and sugar are used in greater quantities in winter than in other seasons. Even when based on data for all consuming groups the year around, the average per capita quantities of foods entering household kitchens would not be strictly comparable to those based on statistics of national food supplies at retail levels after allocations to military and foreign groups have been deducted. Some differences would be expected because disproportionate amounts of a few commodities, for example, meats, go into commercial meals eaten by family members away from home, and other commodities, such as sugar, disappear into processed foods, including canned goods and bakery products.

More important than the average per capita figures for quantities of foods consumed, or for nutritive value of the diets of a national sample of families, is the magnitude of deviations from the average exhibited by subgroups and by individual families. Some of the variations are related to socioeconomic factors: income, household size and composition, seasons, urbanization, and national economic cycles, as shown in table 1 for foods consumed and in table 2 for nutrient content of diets. Different commodities and different nutrients are affected by the various factors studied. From these

Table 1. Food consumption by families in different socioeconomic situations [1]

[Pounds per person per week]

Socioeconomic factors (with income and household size [2])	Leafy, green, yellow vegetables	Citrus fruits, tomatoes	Other vegetables, fruits	Dry beans, peas, nuts	Milk, cream, cheese, (milk equivalent)	Meat, poultry, fish, eggs	Fats, oils	Grain products (flour equivalent)	Sugars, sweets
United States, 1948:									
National supply, year average	2. 25	2. 04	6. 83	0. 29	10. 38	3. 94	1. 25	3. 29	2. 04
Family consumption, urban, spring, $3,606; 3.29 persons	2. 23	3. 45	6. 05	. 27	10. 01	3. 84	1. 11	2. 73	1. 42
Income:									
Low, $1,000–1,999, 3.23 persons	2. 00	2. 96	5. 16	. 37	8. 60	3. 35	1. 20	3. 18	1. 46
High, $4,000–4,999, 3.50 persons	2. 56	3. 76	6. 62	. 23	10. 63	4. 18	1. 09	2. 65	1. 41
Household composition:[3]									
Without children	2. 26	3. 12	6. 08	. 28	9. 72	4. 17	1. 27	2. 93	1. 43
With children	2. 10	3. 73	5. 42	. 23	11. 14	3. 76	. 98	2. 31	1. 27
Region, winter, $2,000–2,999:									
North (Minneapolis-St. Paul), 3.29 persons	1. 74	3. 37	6. 30	. 26	10. 83	3. 34	. 99	2. 64	1. 30
South (Birmingham), 3.27 persons	1. 92	2. 82	5. 01	. 51	9. 22	3. 75	1. 76	4. 33	1. 99
Season (Minneapolis-St. Paul):[4]									
Winter, $3,277, 2.60 persons	2. 16	4. 15	6. 95	. 28	11. 42	4. 08	1. 07	2. 39	1. 48
Fall, $3,161, 2.47 persons	2. 33	4. 15	8. 76	. 20	10. 40	4. 09	1. 10	2. 26	1. 43
Urbanization (Minnesota), spring:[4]									
Urban, 1949, $4,020, 2.25 persons	2. 40	3. 89	7. 51	. 22	11. 78	4. 58	1. 17	2. 36	1. 42
Rural, 1950, $2,000, 2.71 persons	1. 49	2. 23	6. 48	. 28	13. 26	4. 86	1. 50	3. 26	1. 97
Economic cycles, low-third incomes:									
1942, under $1,736, 3.00 persons	2. 09	2. 31	5. 47	. 35	7. 37	2. 67	1. 14	2. 96	. 91
1948, under $2,535, 3.28 persons	2. 12	3. 07	5. 35	. 33	9. 01	3. 43	1. 17	3. 04	1. 42

[1] Data compiled from various published and unpublished sources. See (*11*).

[2] Unless otherwise specified, figures are for consumption by urban families of the United States for 1 week in the spring of 1948. Average incomes, based on 1947 income after Federal income tax, are given for each group unless a specified income class is selected for the comparison.

[3] Data are for purchased quantities only, at similar average weekly food expense, $7.21 and $7.01 per person, for families without and with children. This occurred among families without children at incomes of $2,000–2,999, 2.45 persons, and with children at $5,000–7,499, 4.11 persons.

[4] Comparison based on selected family types.

analyses, it has become possible to know where, when, and at what foods or nutrients to look for underconsuming groups of families.

Income and Family Diets

The effect of income on the adequacy of family diets is illustrated in figure 1 (*11*). In the spring of 1948, with incomes of $1,000 to $2,000, 50 percent of the urban families had diets meeting the National Research Council's allowance in calcium, 69 percent met NRC's allowance in ascorbic acid (vitamin C). With incomes of $5,000 to $7,500, 64 percent of the families met the allowance in calcium—88 percent in vitamin A.

Differences in the quantity of major foods making up these diets were even more marked than the differences in their nutrient values, because, fortunately, many assortments of foods can combine to give an adequate diet.

Such figures show that income is an important factor in assuring an adequate diet and also that many low-income families do obtain needed quantities of important dietary essentials. The figures reveal also that adequate purchasing power does not necessarily mean adequate diet, since even high-income families had diets low in some essential nutrients.

The figures do point up the need for continued education to teach people how to obtain good diets and to convince them that something worth while might be gained by improving their customary food habits in line with the principles of good nutrition.

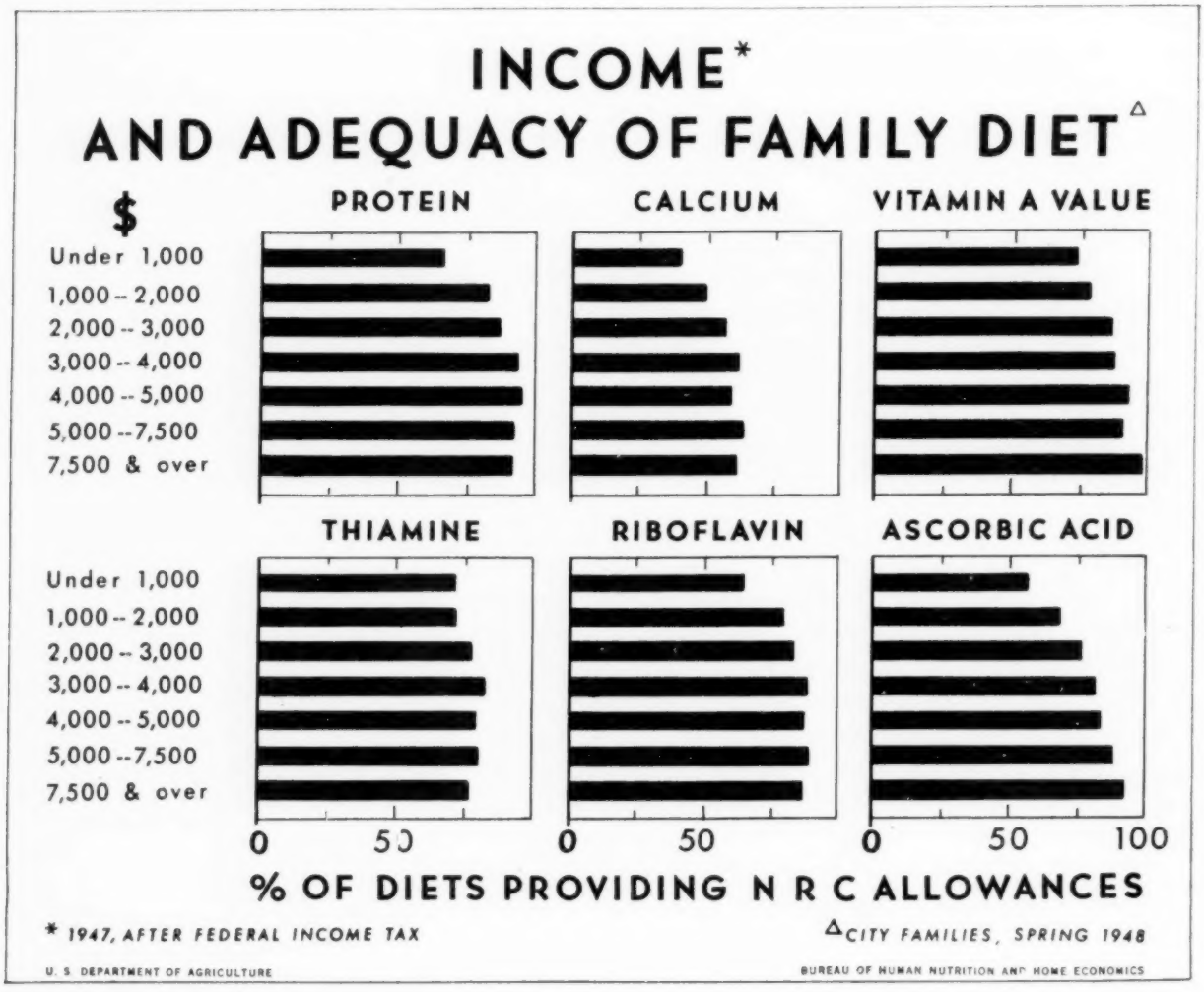

Figure 1.

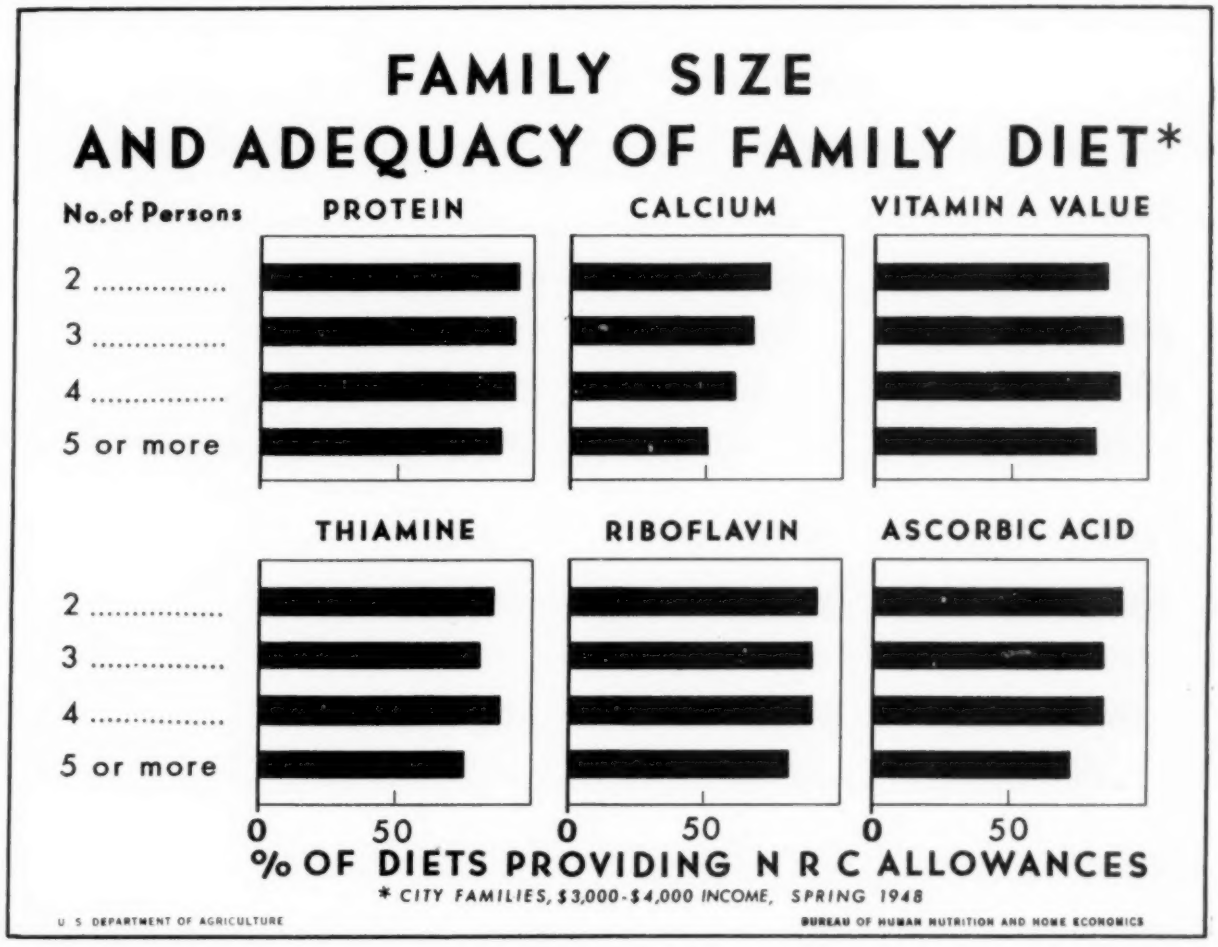

Figure 2.

Differences in food habits associated with region and season made only small differences in adequacy of diets when incomes were comparable. Diets of rural families were particularly low in ascorbic acid due to low consumption of leafy green vegetables, citrus fruits, and tomatoes, but incomes were only about half those among urban families with better diets in the same area (tables 1 and 2).

Family Size and Diets

The relation of family size to the adequacy of diets may be seen in figure 2 for a selected income group. In general, large families of five or more persons had poorer diets until income levels of more than $4,000 were reached. The large families then had diets about as good as smaller families except for calcium content.

At every income level, fewer large families had diets adequate in calcium. Families with children under 16 tended to have somewhat better diets than those with no children, except at the lowest income levels. Even at the lower end of the income distribution, where the purchasing power available per family member was small in the large families with children, it was surprising that the nutritive quality of their diets compared so favorably with that of the smaller, childless families.

Education and Family Diet

The extent of the homemaker's education may explain some of the differences in skill of selecting good diets with a given income and expenditure for food (fig. 3). At less expense per person, college-educated homemakers obtained diets more adequate in all nutrients, particularly in calcium and ascorbic acid (vitamin C),

which are most often the limiting nutrients, than did homemakers of high school or elementary school education.

For example, in the spring of 1948, ascorbic acid was found adequate in 91 percent of the diets of urban families having homemakers with one or more years of college—in 83 percent of those with high school education—and in 69 percent of those with only an elementary education. At that time, the average expense per person per week in 3-person families was $7.12, $7.52, and $7.95 for families with homemakers of college, high school, and elementary school education, respectively.

Table 2. Percentage of diets of families meeting National Research Council's allowances under different socioeconomic situations [1]

Socioeconomic factors (with income and household size [2])	Food energy (3,000 calories or more)	Protein (70 gm. or more)	Calcium (1.0 gm. or more)	Iron (12.0 mg. or more)	Vitamin A value (5,000 I. U.[3] or more)	Thiamine [4] (1.5 mg. or more)	Riboflavin [4] (1.8 mg. or more)	Niacin [4] (15 mg. or more)	Ascorbic acid [4] (75 mg. or more)
United States, 1948: Family consumption, urban, spring, $3,606; 3.29 persons	79	89	58	87	86	78	84	80	79
Income:									
Low, $1,000–1,999, 3.23 persons	77	83	50	86	78	72	79	78	69
High, $4,000–4,999, 3.50 persons	83	95	59	88	94	79	88	86	83
Region, winter, $2,000–2,999:									
North (Minneapolis-St. Paul), 3.29 persons	83	94	55	85	91	75	88	83	75
South (Birmingham), 3.27 persons	90	96	65	98	93	94	94	88	77
Season (Minneapolis-St. Paul): [5]									
Winter, $3,277, 2.60 persons	88	93	68	90	95	78	88	83	87
Fall, $3,161, 2.47 persons	81	90	56	86	92	78	80	82	84
Urbanization (Minnesota), spring: [5]									
Urban, 1949, $4,020, 2.25 persons	92	95	68	93	96	86	88	90	85
Rural, 1950, $2,000, 2.71 persons	82	95	69	90	84	83	91	77	51
Household size, $2,000–2,999:									
2 persons	80	90	59	90	89	82	88	84	78
5 or more persons	62	72	39	80	76	71	67	69	60
Household composition: [6]									
Without children	75	89	55	88	88	80	85	79	75
With children	80	94	61	91	91	83	90	90	88
Education of homemaker, $2,000–2,999:									
Elementary only, 3.63 persons	71	83	49	84	78	75	75	75	65
College, 3.12 persons	83	96	61	98	100	78	94	80	89

[1] Data compiled from various published and unpublished sources. See (*11*). The nutritive value per nutrition unit (physically active man) per day of the food consumed at home by each household was computed and then compared with the National Research Council's recommended allowances for a physically active man (revised 1948).

[2] Unless otherwise specified, figures are for consumption by urban families of the United States for 1 week in the spring of 1948. Average incomes, based on 1947 income after Federal income tax, are given for each group unless a specified income class is selected for the comparison.

[3] International units.

[4] Estimated average cooking losses for the three B-vitamins and for ascorbic acid (vitamin C) were deducted from the aggregate value of foods consumed.

[5] Comparison based on selected family types.

[6] Data are for purchased quantities only, at similar average weekly food expense of $7.21 and $7.01 per person for families without and with children. This occurred among families without children at incomes of $2,000–2,999, 2.45 persons, and with children at $5,000–7,499, 4.11 persons.

Improvement in U. S. Diets

From 1942 to 1948, the improvement in diets occurred at all income levels but was most striking among the third of families with the lowest incomes. Some differences in food quantities consumed by the lowest income third are shown in the last two lines of table 1.

The impact of shifts in food choices in the 6-year period on over-all diet quality is best seen from a comparison of the nutritive values for diets of families in comparable income and family size groups, as shown in table 3 (*2*). In 1948, families in the lowest third of the income distribution had diets 14 to 35 percent higher in various nutrients (except vitamin A) than did corresponding families in 1942.

Higher calorie content of diets was attributable to greater use of vegetables, fruits, milk, eggs, meats, and sugar in 1948 than in 1942, more than offsetting a lower consumption of potatoes and grain products. More calcium (20-percent increase for families of the lowest income third) was due to more milk in diets in 1948. More milk, eggs, and meats meant more protein, amounting to a 16-percent increase for families in the lowest third of incomes. A 16-percent increase also in ascorbic acid value of diets of families with lowest incomes was attributable to greater use of citrus, other fruits, and fresh vegetables. Families in the middle and highest income thirds had about the same or slightly less ascorbic acid in 1948 than in 1942.

Estimated quantities of three B-vitamins (thiamine, riboflavin, and niacin) were higher by 28 to 35 percent in diets of the third of families with lowest incomes in 1948 than in those of the lowest third in 1942. Increases of only 12 to 21 percent occurred for families in the middle and highest thirds. One reason for the greater gains of the lowest income third was

Table 3. Nutritive value of diets, 1948 and 1942, by income—average nutritive value per nutrition unit per day of food consumed at home, urban housekeeping families of two or more persons, by income thirds, United States, spring 1948 and spring 1942 [1]

Year and income third	Food energy	Protein	Calcium	Iron	Vitamin A value	Thiamine	Riboflavin	Niacin	Ascorbic acid
	Average nutritive value of diets per nutrition unit per day								
1948									
All classes [3]	(*calories*) 3,800	(*gm.*) 102	(*gm.*) 1.07	(*gm.*) 17.5	(*I. U.*) [2] 10,100	(*mg.*) 2.36	(*mg.*) 2.66	(*mg.*) 24.1	(*mg.*) 165
Lowest third	3,830	100	1.02	17.8	9,700	2.38	2.58	23.7	157
Middle third	3,770	102	1.09	17.2	9,900	2.34	2.69	23.5	164
Highest third	3,810	104	1.10	17.5	10,800	2.35	2.72	25.0	175
1942									
All classes	3,520	92	0.92	14.5	9,700	1.90	2.19	20.0	162
Lowest third	3,370	86	.85	14.2	8,900	1.79	2.01	17.5	135
Middle third	3,590	95	.97	14.7	9,900	1.98	2.28	20.9	172
Highest third	3,590	94	.94	14.7	10,200	1.94	2.27	21.7	180
	Ratio: 1948/1942								
All classes	1.08	1.11	1.16	1.21	1.04	1.25	1.21	1.20	1.02
Lowest third	1.14	1.16	1.20	1.25	1.09	1.33	1.28	1.35	1.16
Middle third	1.05	1.07	1.12	1.17	1.00	1.18	1.18	1.12	.95
Highest third	1.06	1.11	1.17	1.19	1.06	1.21	1.20	1.15	.97

[1] Represents the nutritive value of food brought into the kitchen for household use per adult man (nutrition unit). No allowance has been made for losses that may occur during handling, cooking, or other kitchen practices, or for losses incurred during storage of left-overs.

[2] International units.

[3] Averages for 1948 exclude 147 families for whom no income data were obtained.

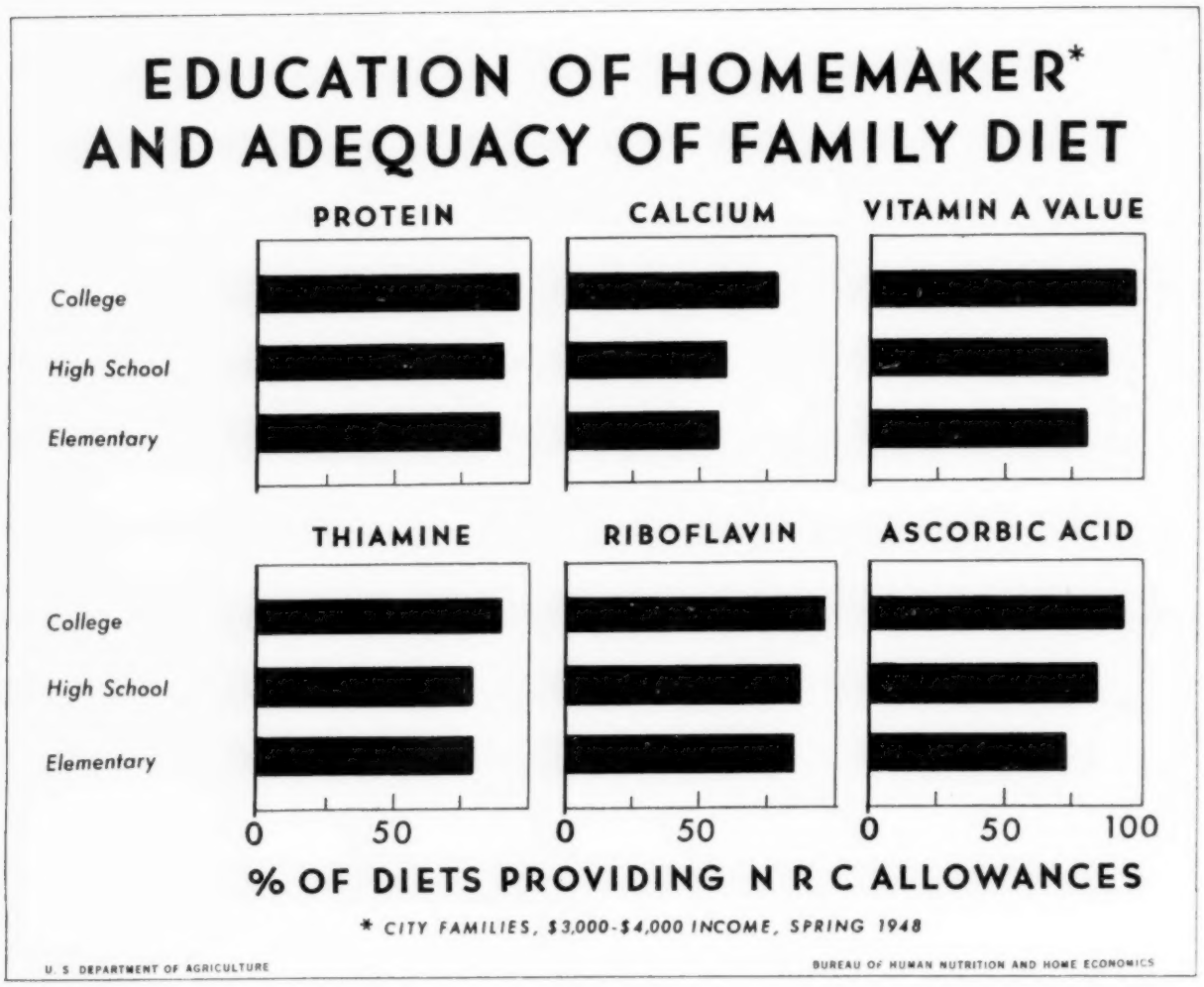

Figure 3.

their 20-percent increase in meat consumption compared to little or no change for the middle and highest thirds.

Another reason was the enrichment of white bread and flour, since grain products contribute a larger share of nutrients in diets of low-income families than in diets of high-income families. Even without enrichment of bread and flour, the amounts of iron and niacin in family diets in 1948 would, on the average, have been 8 percent higher, and thiamine would have been 11 percent higher, due to greater consumption of meats, poultry, eggs, and some vegetables and fruits.

Riboflavin would have been 18 percent higher in 1948 than in 1942 without the benefit of stepped-up enrichment, chiefly because of the increased consumption of milk and many milk products. Enrichment was responsible for 11 percent of the iron and niacin averaged in urban diets in 1948, and for 14 percent of the thiamine, and 3 percent of the riboflavin (*11*). The effect of enrichment on the nutrient content of the national food supply during the war years and thereafter may be seen in figure 4.

Conclusion

Surveys of family food consumption may be used as a basis for planning national and family food supplies, industrial and school lunch feeding, and nutrition education of families and individuals.

Whether the surveys are local, State, regional, or national, underconsuming groups are most likely found among low-income fam-

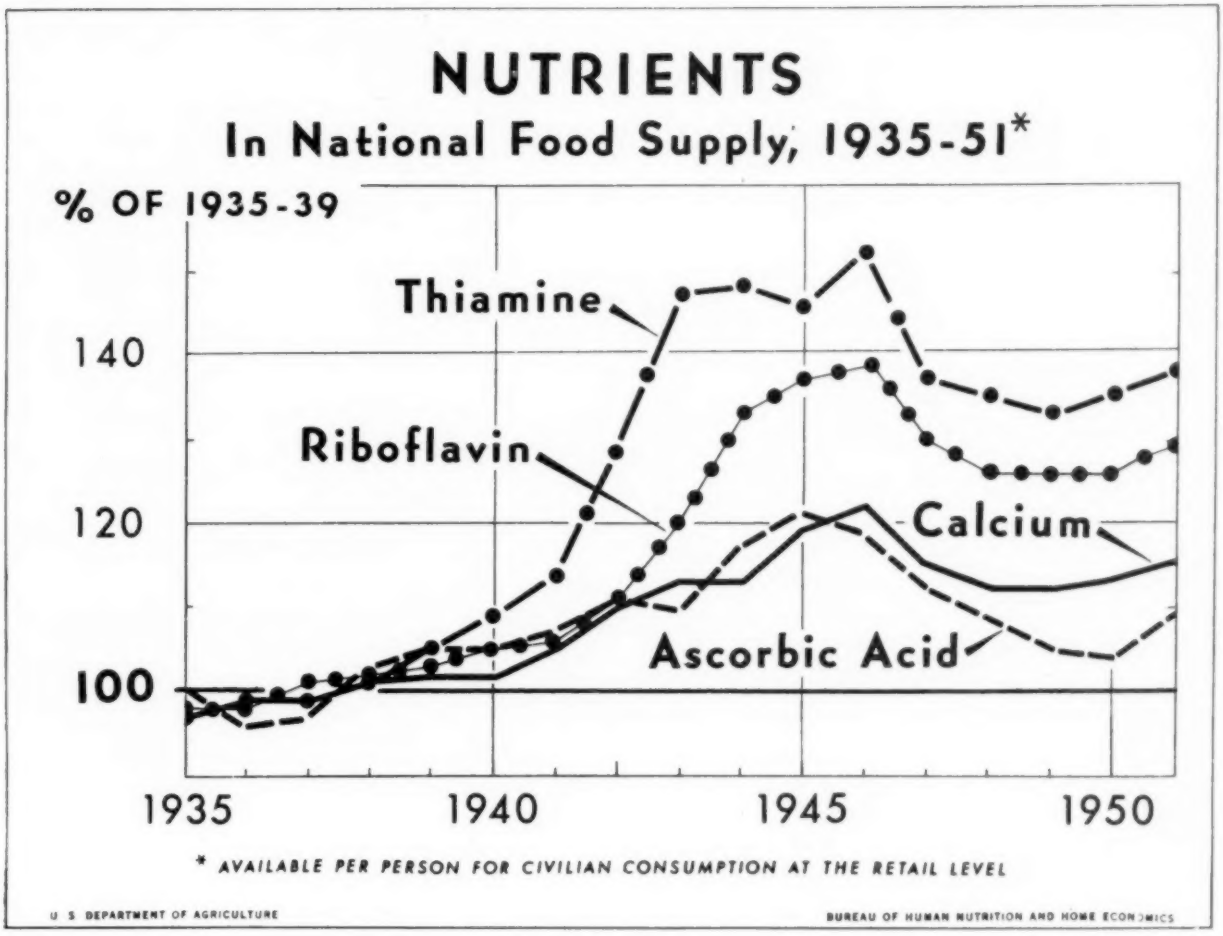

Figure 4.

ilies of large size with homemakers of less than high school education. But small families with high incomes and college-educated homemakers often have diets that do not meet nutrition allowances in several nutrients.

Low dietary quality can usually be predicted from the consumption of milk and the fruits and vegetables rich in vitamin C. The figures for calcium and ascorbic acid content of diets are usually most indicative of nutritive adequacy.

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New Heart Radio Series

"The Human Heart," a new series of eight quarter-hour dramatic radio transcriptions, is available for use in community health education. The series reports on progress in the treatment of various types of cardiovascular diseases.

The programs are designed for weekly broadcast over local radio stations by health departments and interested civic groups. Provision is made throughout the series for local live announcements of community sponsorship. Any one of the programs, however, may be used for nonbroadcast purposes—in classrooms, for instance.

Each transcription dramatizes a typical experience with a serious heart or circulatory ailment, as portrayed by a well-known radio or screen actor. Each story approaches the individual adjustment problem from a personal point of view—the doctor's or the patient's—that of the father, the mother, or the child. A brief commentary by a physician guest speaker ends the programs.

One program, "The Beautiful Noise," tells the story of a child born with a heart defect who becomes part of normal neighborhood life after an operation. Another, "A Matter of Strategy," tells how warning angina pains persuaded an explosive baseball manager to manage his team in a more relaxed fashion.

Sponsored by the Public Health Service, Federal Security Agency, the series was prepared under the auspices of the National Heart Institute and the Division of Chronic Disease and Tuberculosis, in the Public Health Service, and with the cooperation of the American Heart Association. It was produced and is being distributed by the Communication Materials Center, a division of Columbia University Press, 413 West 117th Street, New York 27, N. Y.

Drug Experience in Two Programs For Medical Care

By HERBERT NOTKIN, M.D., BETTIE ROGERSON, D.Sc., WILFRID DAVIS, M.D., and MATTHEW TABACK, M.A.

Drugs on a prescription basis, as well as home and office care by physicians, are provided low-income residents of Maryland, under two tax-supported medical care programs administered with funds allocated by annual appropriations of the State legislature.

The county medical care program, which operates in all Maryland counties, is administered jointly by the State Department of Health and the county health departments; the Baltimore City medical care program, confined to residents of Baltimore City, is administered by the Baltimore City Health Department.

Although the two programs differ basically in their manner of providing physicians' services, their drug policies are practically identical. Because the method of providing drugs is similar in both programs and their methods of payment are highly centralized, it has been possible to study some of the characteristics of this phase of medical care. Administrators of other medical care programs which supply or are contemplating the provision of drugs to their beneficiaries may find Maryland's experience helpful. Results of a careful evaluation of the ingredients noted on a sample of prescriptions studied by a team associated with the Baltimore City medical care program will be discussed in a subsequent report.

Dr. Notkin is assistant chief and Dr. Rogerson is a biostatistician in the bureau of medical services and hospitals, Maryland State Department of Health. Dr. Davis is the director of the medical care section and Mr. Taback is director of the bureau of biostatistics, Baltimore City Health Department.

County Medical Care Program

The county program, begun in 1945 and now in operation in all Maryland counties, provides physicians' services in the home and office, drugs—prescribed and dispensed—dental services, and hospital out-patient diagnostic services. All recipients of public assistance are automatically eligible for service. Medically indigent persons who are able to pay for their basic food, shelter, clothing, and similar needs but who are unable to pay for medical care are also eligible. Their eligibility is determined by the local health officer primarily on the basis of income, although exceptions may be made for medical or social reasons.

All professional participants in the program are paid on a fee-for-service basis, according to established fee schedules worked out with representatives of the professions involved. Patients have free choice of physician, dentist, and pharmacist, and those who provide service are free to accept or to reject patients.

Baltimore City Medical Care Program

The Baltimore City program, in operation since 1948, provides clinic services, home and office services by physicians, prescribed drugs, and emergency dental care to recipients of public assistance in the city. The method of providing physicians' services contrasts sharply

with the county program. Each beneficiary is assigned to one of the medical care clinics operated by six of the large hospitals in the city. At the clinic he receives a physical examination and selects a physician from a list of those participating in the program. Thereafter he is under the care of the chosen physician, who receives a summary of the findings of the clinic examination and to whom the services of the clinic are available for consultation.

Physicians are paid on a quarterly capitation basis—a predetermined sum paid quarterly in advance for each patient accepted.

Provision of Drugs

The two programs have similar drug policies. Prescriptions are written on a special form, which is similar for both programs. The patient has the prescription filled at any pharmacy which cooperates with the program. The pharmacist bills the program according to the following established fee schedule:

> The program pays for the wholesale cost of the drug, plus the cost of container, plus a specified mark-up—$0.35 for uncompounded prescriptions and $0.50 for compounded prescriptions whose ingredient plus container cost total less than $2.50. For prescriptions with an ingredient-plus-container cost of more than $2.50, a 30-percent mark-up is allowed. The two exceptions to this schedule are: (1) the programs will in no case pay more than the current retail price for a drug, and (2) insulin is paid for at the minimum fair trade price.

In general, physicians have complete freedom in prescribing drugs. However, both programs urge the use of U. S. Pharmacopeia and National Formulary drugs. The few limitations on freedom of prescribing are slightly different for the two programs. The county program does not allow payment for *spiritus frumenti*, streptomycin, or highly experimental and expensive drugs such as cortisone, ACTH, and pregnenelone. In the city program, all drugs with the exception of *spiritus frumenti* may be prescribed, but expensive or unusual drugs require approval of a clinic or of the program director.

In addition to prescriptions, when the cost of dispensed drugs is 50 cents or more the county program allows physicians to bill them at cost. Although this procedure is fairly widely used in some of the rural areas of the State, the cost of dispensed drugs during 1951 totaled $11,746, only 6 percent of the total drug cost of the program.

Drug Data

County Medical Care Program

The more important indexes of pharmacy service provided by the county medical care program from 1946 through 1951 are shown in table 1. The total payments for all professional services are included to show the relative amounts of services provided. The striking feature of this table is the continuous increase in all the indexes of pharmacy service. Expenditures for prescribed drugs have risen out of proportion to expenditures for all services.

Table 1. Pharmacy services in the Maryland county medical care program, 1946–51

Selected data	Calendar year					
	1946	1947	1948	1949	1950	1951
Total payments—all services	$212, 557	$366, 184	$543, 343	$556, 863	[1] $718, 083	$661, 126
Payments for pharmacy services	$29, 439	$52, 969	$96, 781	$123, 197	$182, 004	$170, 021
Percent pharmacy payments of total payments	13. 8	14. 5	17. 8	22. 1	25. 4	25. 7
Number of pharmacies participating	[2] 172	278	302	328	368	357
Number pharmacy invoices	25, 668	44, 344	75, 795	92, 333	126, 291	113, 480
Average payment per invoice	$1. 15	$1. 19	$1. 26	$1. 33	$1. 44	$1. 50
Number physicians' calls	59, 209	97, 443	136, 259	147, 147	180, 840	172, 692
Average number pharmacy invoices per 100 physicians' calls	43	45	56	63	70	66

[1] This represents billings. Payments to physicians, dentists, and hospitals prorated at 70 percent for 4 months.
[2] For 9 months only, January–September 1946.

In 1946, pharmacy costs were only 13.8 percent of the cost of all services. By 1951, they constituted about 25 percent of the costs of all services. The slight increase in percentage of pharmacy payments from 1950 to 1951 should be noted. This is the first time in the history of the program that there was not a marked rise in this index.

The increase in the average cost per prescription, from $1.15 in 1946 to $1.50 in 1951, is one factor contributing to this picture. Only one minor change in the pharmacist's mark-up fee has been made during this period, and the increase in average cost of prescriptions reflects both general wholesale price rises and the widening use of more expensive drugs.

There is, however, another trend which adds to the rapidly mounting drug costs. Physicians are now writing more prescriptions per call than they did 4 years ago. In 1946, 43 prescriptions were written per 100 physicians' calls. By 1950, 70 prescriptions were being written for each 100 physicians' calls. By 1951, however, this index had dropped to 66 prescriptions per 100 physicians' calls. This is the first time that a decrease has been observed in any index of pharmacy service. Together with the leveling off of the percentage of total payments for pharmacy service, this may presage a stabilization of pharmacy expenditures. A moderate program (see summary) of information for cooperating physicians concerned with the economics of drug distribution may serve to keep drug utilization at the lowest level consistent with good medical practice.

Uncompounded prescriptions make up the bulk of the drugs supplied. During 1951, 88 percent of all prescriptions were of this type. Refills constituted approximately 13 percent of all prescriptions, a figure well below the estimated 29 percent for prescriptions filled by all pharmacies in the State in 1950. Of the $170,221 spent for services rendered by pharmacies in 1951, 66.7 percent represented the cost of the ingredients; 4.3 percent, container costs; and the remaining 29.0 percent, mark-up fees to pharmacists in return for professional services rendered.

In 1951 for persons receiving public assistance, the per capita cost of providing prescribed drugs was $6.12, an average of 4.3 prescriptions per person. Unfortunately, it is not possible to determine this index on an age specific basis at this time.

Nearly 93 percent of all licensed pharmacies in the counties filled prescriptions for the program during 1951. Pharmacists in Baltimore City, the District of Columbia, and States adjacent to Maryland also participated. Table 2 shows the distribution of pharmacies by location and number of prescriptions filled. As might be expected, the majority of the participating pharmacies are located in the counties of Maryland. However, a substantial number of out-of-county pharmacies also rendered service under the program.

There is a marked difference in the extent of participation of various pharmacies. Over a fifth of all participating pharmacies filled less than 10 prescriptions each in the year. At the other extreme, 34 pharmacies filled more than 1,000 prescriptions each during 1951, with 2 filling more than 4,000 prescriptions.

Consideration of the drug-dispensing characteristics of the program shows a pattern which indicates that a small or moderate volume of service is provided by most of the participating pharmacies, and a large volume of service is given by a relatively small number.

Baltimore City Medical Care Program

Since the Baltimore City medical care program has been in operation only since 1948, and

Table 2. Distribution of participating pharmacies by location of pharmacy and number of prescriptions filled, Maryland county medical care program, 1951

Number of prescriptions	All pharmacies	Location of pharmacy			
		All counties	Baltimore City	District of Columbia	Other States
Total	357	236	86	28	7
Under 10	88	19	50	18	1
10–99	104	67	28	7	2
100–499	102	89	7	3	3
500–999	29	27	1	------	1
1,000–1,999	24	24	------	------	------
2,000–2,999	6	6	------	------	------
3,000–3,999	2	2	------	------	------
4,000–4,999	2	2	------	------	------

Table 3. Pharmacy services in the Baltimore City medical care program, 1949–51

Item	Fiscal year		
	1949	1950	1951
Total payments—all services	$156, 632. 00	$483, 803. 00	$603, 587. 15
Payments for pharmacy services	$42, 038. 00	$113, 991. 00	$155, 759. 77
Percent of pharmacy payments to total payments	26. 8	23. 6	25. 8
Number of pharmacies participating	254	337	343
Number of pharmacy invoices	23, 860	78, 529	103, 686
Average payment per invoice	$1. 76	$1. 45	$1. 50

did not get fully under way until 1950, the historical picture is by no means as complete as that for the county medical care program. However, the comparable available data for the past three fiscal years are shown in table 3. No data are available on the number of prescriptions per physician's call, as the capitation feature of the city program has not furnished complete statistics on the volume of physicians' services rendered in the home or office.

During the early formative period of a medical care program, experience tends to be biased by the fact that persons with chronic or severe illnesses are usually the first to obtain care. The experience of the city program in 1948–49 and early in 1949–50 reflects this bias. The average cost per prescription in 1948–49 was higher than in the other 2 years, which in all probability is due to a high proportion of such expensive drugs as insulin provided in the first year of operation. The later experience of 1949–50 is considered to be fairly representative.

As can be seen from a comparison of tables 1 and 3, both programs spent approximately one-fourth of all funds for the provision of prescribed drugs during the years for which the most recent data are available. The average cost per prescription was exactly the same for this period.

Insofar as the type of prescription is concerned, the experience of the two programs was comparable. Of all prescriptions supplied by the city program in 1950–51, 81 percent were uncompounded, compared to 88 percent under the county program. The experience of both programs was similar in that the average cost of compounded was less than that of uncompounded prescriptions despite a higher mark-up fee, due to lower costs of ingredients in compounded prescriptions.

Table 4 shows the utilization of drugs, by age groups, in the Baltimore City program based on a sample of the assigned population on July 1, 1949. Similar data are not available for the county program. On the average, 3.1 prescriptions were written per person per year. The importance of the age distribution of the population is emphasized by the differences in the age specific rates. The number of prescriptions per person for people in the older age groups considerably exceeds that for younger persons. As a general rule, populations consisting of public assistance recipients are weighted with people in the older age groups, a fact which adversely influences the over-all cost of providing drugs to such populations.

The distribution of pharmacies cooperating with the Baltimore City program, by location

Table 4. Utilization of drugs, by age groups,[1] Baltimore City medical care program—fiscal year 1950

Age	Number persons	Number prescriptions	Total cost	Annual per capita utilization	
				Number	Cost
Total	1, 554	4, 800	$7, 084. 06	3. 1	$4. 56
0–4	90	89	100. 80	1. 0	1. 12
5–19	513	359	511. 42	. 7	1. 00
20–39	180	460	667. 25	2. 5	3. 71
40–59	198	1, 205	1, 788. 83	6. 1	9. 03
60 and over	573	2, 687	4, 015. 76	4. 7	7. 01

[1] Based upon a systematic stratified sample of persons assigned on July 1, 1949, and followed during the ensuing fiscal year.

and number of prescriptions filled, is seen in table 5. Only 5 of the 342 participating pharmacies are located outside of Baltimore City. As is true in the county program, there is wide deviation as to the extent of participation. In general, most pharmacies rendered a moderate volume of service with relatively few filling a large number of prescriptions.

Table 5. Distribution of participating pharmacies by numbers of prescriptions filled, and location of pharmacy, Baltimore City medical care program—fiscal year 1950

Number of prescriptions	All pharmacies	Location of pharmacy	
		Baltimore City	All counties
Total	342	337	5
Under 10	47	45	2
10–99	145	142	3
100–499	101	101	----
500–999	21	21	----
1,000–1,999	13	13	----
2,000–2,999	4	4	----
3,000–3,999	5	5	----
4,000–4,999	----	----	----
5,000–5,999	----	----	----
6,000–6,999	----	----	----
7,000–7,999	1	1	----

Summary

Some of the experiences of the Maryland county medical care program and the Baltimore City medical care program in providing prescribed drugs to beneficiaries are analyzed. Although physicians are paid on a fee-for-service basis by the county medical care program and on a capitation basis by the city program, the drug policies of the two programs are similar. With few exceptions, physicians have complete freedom in prescribing drugs.

Neither of the programs has been willing to restrict this freedom. However, in an effort to counteract the rising cost of drugs to some extent, administrators of both programs have written to all participating physicians urging economy in the prescription of drugs. The county medical care program campaign was carried out primarily in the summer of 1950 and may account to some extent for the leveling off of drug expenditures in 1951. The Baltimore City program campaign was not instituted until the summer of 1951, and therefore its results are not reflected in the statistical material presented here.

The county program has been in operation since 1945. A historical review of drug costs from 1946 through 1951 shows a marked increase both in the numbers of prescriptions supplied and the total dollars spent for prescribed drugs. The percentage of total expenditures devoted to prescribed drugs has been increasing steadily. Contributing to this fact is a rise in the average cost per prescription over the years and an increase in the number of prescriptions written per physician's call. There are some indications that drug costs have reached a peak.

During the past year, both programs spent for prescribed drugs approximately 25 percent of their funds for all services. Between 80 and 90 percent of these expenditures were for uncompounded prescriptions. The average cost per prescription was $1.50 in 1951 for the county program and in the fiscal year 1950–51 for the city program.

The experience of the city program emphasizes the importance of the age distribution of the population served in determining overall drug costs. The number of prescriptions per person per year shows a marked variation with age. Persons in the older age groups receive a considerably larger volume of pharmacy service than do those in the younger age groups.

The participating pharmacists under both programs present a similar pattern in the extent of participation. Most participating pharmacies provided a small or moderate volume of service under the program, with relatively few pharmacies filling more than 3,000 prescriptions in a year.

Refuse-Can Holders

By RALPH J. VAN DERWERKER, B.S., and
CHARLES C. JOHNSON, Jr., B.S.

Sanitary storage of refuse is a desirable goal for every community. It has been reported that the author of a well-known guide to fine eating places will not enter a restaurant until after he has inspected and approved its refuse-storage facilities and practices. Likewise, the desirability of a community or a neighborhood may be measured, not by its front lawns, but by its back yards. The refuse-can holder, rack, or stand is a recently developed device which aids materially in maintaining sanitary refuse-storage conditions.

Refuse Sanitation Problems

Many elements of the community agree on the importance of promoting and maintaining a sound, community-wide, refuse-storage policy and practice. Public health authorities acknowledge the significance of refuse sanitation by initiating periodic clean-up campaigns and by issuing and enforcing regulations governing the storage of refuse awaiting collection. Public works authorities are interested in having refuse confined in proper containers and located at the proper places for collection. The fire department, too, has a legitimate concern in the safe storage and collection of combustible refuse.

Most communities have regulations requiring garbage and other refuse to be placed in water-tight metal containers—5- to 10-gallon containers for garbage and 20- to 24-gallon containers for rubbish, or 30-gallon containers where combined storage is permitted. Such regulations, however, do not solve the problems that arise from the tipping over of containers or the investigation of their contents by dogs or children. Likewise, the problems of deterioration of cans by rust and of accumulations of rotting refuse under cans resting on the ground have seldom been resolved by the existing regulations. The use of refuse-can holders or stands is proving a satisfactory answer to these problems in several communities.

Mr. Van Derwerker is the chief and Mr. Johnson is an engineer in the municipal and rural sanitation branch of the Division of Sanitation, Bureau of State Services, Public Health Service.

Past Experience

Some years ago, the concrete platform was promoted by authorities to eliminate the problems of rust and unsanitary conditions where cans rest on the ground (*1*). However, rodents burrowed underneath these platforms, which provided them with excellent harborage conveniently located near a supply of food. The construction of a 2-foot curtain wall below and around the platform will eliminate this disadvantage, but home owners are likely to balk at the added expense. A container platform with the curtain wall can probably be used to best advantage in multiple-dwelling projects and business areas, where it may be constructed large enough to hold several containers.

Underground, vaultlike structures have also been tried. These structures consist of a cylinder into which the refuse can is lowered and a cover which fits over the cylinder, flush with the ground. The disadvantages of the vaults, however, often outweigh the advantages, espe-

cially where the ground water is high. Sunken cans, therefore, are recommended only where soil drainage is especially suitable or direct drainage is provided.

Frame or boxlike enclosures have long been used to conceal and protect refuse cans and, occasionally, loose refuse. Experience has shown that such structures generally attract rodents and flies because they are difficult to keep clean. Furthermore, people are inclined to use them as substitutes for an adequate number of good quality cans. The best devices for hiding and protecting refuse containers do not result in sanitary conditions, unless, of course, they are adequately maintained.

Essential Requirements for Holders

Sanitary storage of refuse requires a watertight metal container equipped with handles and a tight-fitting cover. Without additional safeguards, however, the benefits of such containers may be minimized. Refuse containers that are kept out of doors should be kept on some type of holder. A good refuse-container holder is one that is convenient for both the householder and the collection crew. It should raise the can at least 12 inches from the ground to allow adequate space for cleaning underneath the can and to prevent rodents from harboring under it (*2*). Circulation of air across the bot-

Figure 1. Refuse cans held on steel hooks.

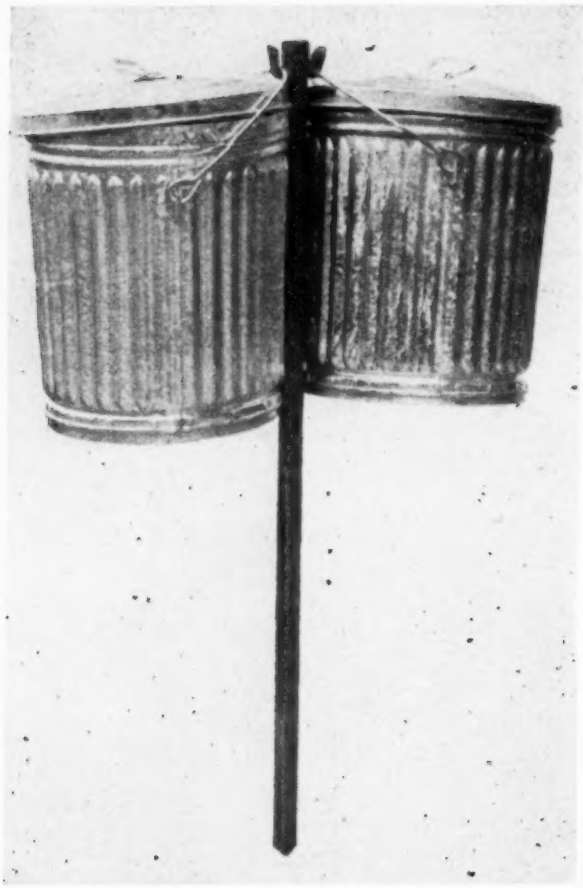


Figure 2. Refuse-can holder consisting of steel post and hooks.

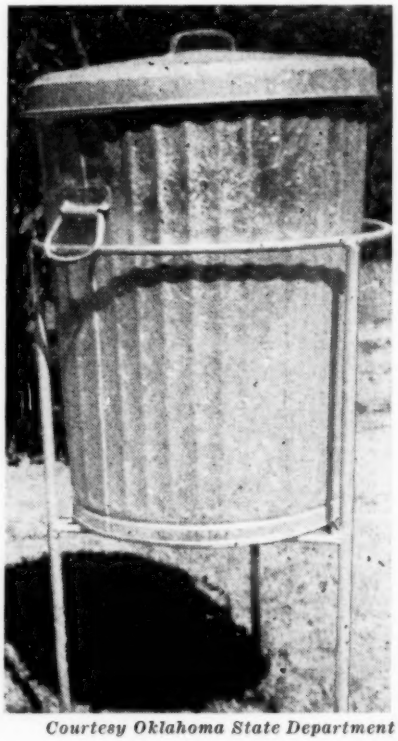
tom of the can keeps it dry and helps to prevent corrosion. The holder should provide support of the can to prevent its being tipped over by dogs or children. Finally, it should be made of a durable material, one that is not subject to excessive deterioration as a result of varying types of climatic conditions.

Recommended Holders

There are several types of commercial stands and holders which meet these requirements. One of the simplest is a steel hook that can be fastened to the house or to a fence post (fig. 1). Another type comes complete with a steel post, hooks, and sometimes a chain for the can cover (fig. 2). The post need only be set in the ground in a convenient place to be ready for use. Some housing developments are providing such container racks as standard equipment for the tenants. The neat rows of refuse containers and the cleanliness of the community are results that are immediately noticed.

A more substantial stand, which has been used in some communities, is constructed of pipe and pipe fittings. Once the pipe is cut and threaded, it can easily be assembled by the householder. Lengths of pipe or reinforcing steel may also be welded together to make a stand (figs. 3 and 4). Because these stands are made of metal and have rigid joints, they can be considered permanent.

Though somewhat less durable, stands constructed of lumber are also being widely used. Some health departments have distributed plans to make it easy for the householder to construct these stands at home. The Public Health Service has also suggested such a stand. In figure 5 are a list of materials and diagrams for its construction. This stand is designed to hold a standard container of 30-gallon capacity; where cans of smaller capacity are used, the dimensions should be made smaller so that the can will be held securely in place. The recently completed film by the Public Health Service,



Courtesy Oklahoma State Department of Health

Figure 3. One-can stand made of reinforcing steel welded together.

"Sanitary Storage and Collection of Refuse," portrays the use and advantages of this type of stand (see p. 787, this issue of *Public Health Reports*).

Promoting Community Programs

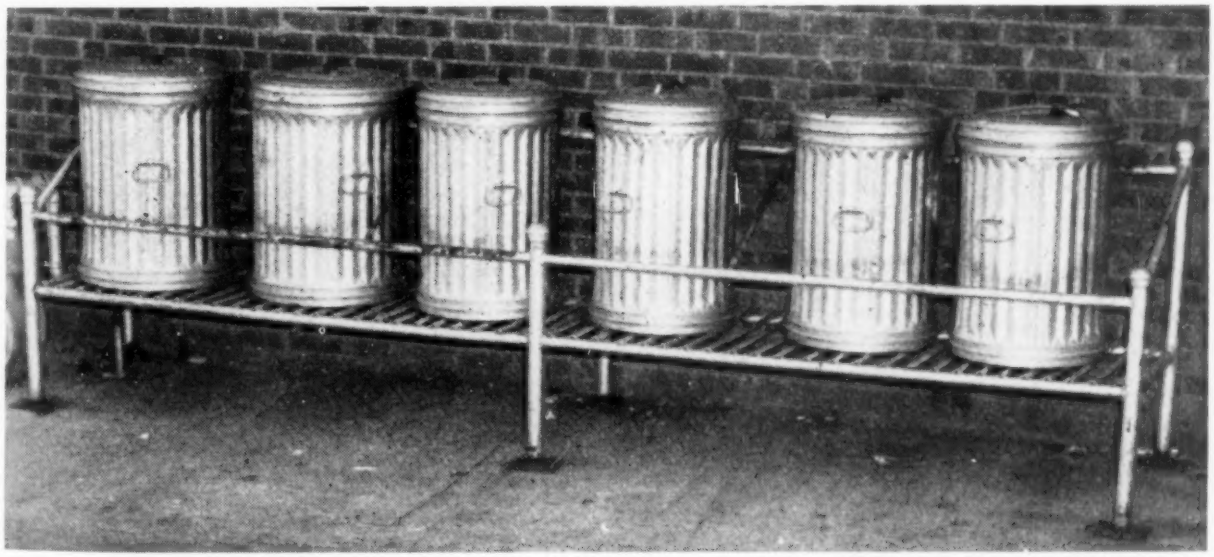
The first step in stimulating community interest in refuse sanitation is the dissemination of information regarding the hazards of insanitary conditions. Citizens should be informed of the danger of diseases borne by flies, rats, and other pests that breed or find harborage in improperly stored garbage and rubbish (*3*). Broken glass, tin cans, and bottles (sometimes containing residual poisons or unwanted medicines) constitute serious accident hazards. Wood, rags, paper, and other combustible rubbish are fire hazards. Obnoxious sights and odors can depreciate property values. Hidden costs of improper refuse storage include higher medical and hospital bills, higher insurance rates, and higher taxes.

Specific campaigns, of course, will depend largely upon the community involved—its economic status, its percentage of home owners, and the educational level of its citizens. Municipal authorities should not find it too difficult, however, to enlist the aid of the many diverse elements of the community which are directly or indirectly concerned with the problem. Local public information media, such as community newspapers and radio stations, can be urged to contribute space and time as a public service. Civic organizations (Rotary, Kiwanis, Lions), business organizations (chambers of commerce, boards of trade, neighborhood associations), women's organizations, parent-teacher associations, garden clubs, professional associations (especially those related to medicine), and many others can be shown to have a personal interest.

The Public Health Service has published a leaflet (Public Health Service Publication No. 183) which contains recommendations concerning the proper storage of refuse by the householder. This leaflet could be distributed throughout a community as an aid in promoting good practice. The leaflet, entitled "Safe and Sanitary Home Refuse Storage," can be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for $1 per 100 copies. The Public Health Service film mentioned above will also be found useful in community programs for promoting refuse sanitation.

Current Programs

That campaigns for sanitary refuse-can holders can be successful is attested by such communities as Watertown, S. Dak., where it

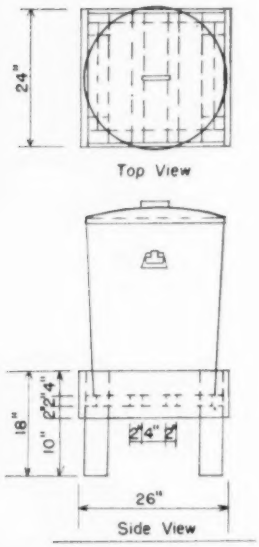


Courtesy Oklahoma State Department of Health

Figure 4. Multiple-can stand made of pipe with welded joints.

is reported that half of the population of 18,000 now have them. In Cleveland, Ohio, the city health department assembles holders from welded reinforcing steel and sells them to householders at a very reasonable price. Waynesboro, Va., has successfully encouraged the use of pipestand holders on a community-wide basis.

ONE CAN GARBAGE STAND



Bill of Materials	
Lumber Size	Pieces
2"x4"x18"	4
2"x2"x22"	2
2"x2"x18"	2
2"x2"x16"	2
2"x2"x 4"	4
1"x8"x24"	4
Nails	
3"Common Wire	$\frac{1}{2}$ lb.
$3\frac{1}{2}$"Common Wire	$\frac{1}{2}$ lb.

Figure 5. Diagrams and materials for construction of wooden stand to hold 30-gallon refuse can.

In Rapid City, S. Dak., a citizen placed a refuse-can holder on his front lawn to demonstrate its desirable qualities; as a result, many others in the city began using holders. Mandan, N. Dak., encourages the use of stands as part of its refuse sanitation program, which was initiated in conjunction with the recently completed city-State-Public Health Service demonstration of a sanitary landfill. The Oklahoma State Department of Health is also promoting the use of refuse-can racks throughout the State (*4*).

In many instances, the acceptance of the principles of refuse-can racks or holders by the residents of a community has led swiftly to a general improvement in sanitation practices in other respects.

Summary

The use of refuse-can holders appears to be the best answer thus far to the problem of protecting the cans from excessive rust, from being tampered with by children, and from invasion by pets or vermin. Since refuse-can holders keep the cans off the ground with sufficient clearance for good housekeeping of the area, the accumulation of rotting refuse rarely occurs. The orderliness developed by the use of holders in turn helps to beautify the surroundings.

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Two Surveys of Disabling Illness

By THEODORE D. WOOLSEY, B.A.

New estimates of the prevalence of disabling illness among persons aged 14 to 64 years in the United States have recently been compiled from the results of two sample surveys, identical in plan, undertaken in February 1949 and September 1950. The findings of the first of these surveys have been available for some time (*1*, *2*), but users of the data were cautioned to take into account the fact that the amount of illness in the country is usually at or near the top of the seasonal cycle in February. The statistics presented for February 1949, therefore, overestimated the amount of disabling illness that one would find in the United States on an average day. On the basis of that survey it was estimated that 4.6 million persons between the ages of 14 and 64 years, inclusive, were unable to carry on their usual activities because of some illness or other medical condition.

As had been expected, the second survey revealed a lower prevalence (table 1). In September 1950, the estimate indicated that slightly more than 3.6 million persons aged 14 to 64 were disabled, using the same criteria of inability to carry on usual activities. Most of the difference between the two figures was in the cases of illness of short duration, that is, the cases for which disability had lasted a month or less. Many of these illnesses were probably the minor respiratory infections which are responsible for the greater part of the seasonal differences.

On the other hand, the number of persons who, at the time of the survey, had been disabled for more than 3 months was not greatly different in September 1950 from the corresponding number in February 1949. The estimate from the earlier survey was 2.3 million and from the later survey, 2.2 million. These must have been chiefly chronic disabling cases, and the stability of the number is in accordance with expectation.

A comparison of the numbers of persons dis-

Public Health
MONOGRAPH 4

This article is a summary of the principal findings presented in Public Health Monograph No. 4, published concurrently with this issue of *Public Health Reports*. The author is a biostatistician in the Division of Public Health Methods, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch, Public Health Service. Copies will be found also in the libraries of professional schools and the major universities, and in selected public libraries.

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Woolsey, Theodore D.: Estimates of disabling illness prevalence in the United States. Based on the Current Population Survey of February 1949 and September 1950. Public Health Monograph No. 4 (Public Health Service Publication No. 181). U. S. Government Printing Office, Washington, 1952. Price 15 cents.

abled for more than 3 months (lower half of table 1) and the numbers of all persons found to be disabled (upper half) indicates that the cases of longer duration form a proportion of the total that (*a*) increases steadily with age; (*b*) is higher in September than in February; and (*c*) is higher for males than for females.

The surveys did not cover the population of resident institutions, such as hospitals for mental disease, tuberculosis sanatoriums, homes for the aged, and orphanages. The number of disabled persons 14 to 64 years of age in these institutions is estimated at roughly 750,000. Most of these have undoubtedly been disabled for more than 3 months, and, hence, would have appeared in the lower part of table 1, as well as in the upper part, if they had been included in the survey.

In addition to supplying national estimates of the numbers of disabled persons, the two surveys also afford an opportunity to make comparisons of the prevalence of disabling illness in the main age and sex groups of the population aged 14 to 64 years and in urban, rural, and employment status categories. Tables 2 and 3 shown here are abstracted from Public Health Monograph No. 4 in which the findings from the September 1950 survey are brought together with those from the survey of February 1949, and the averages of the prevalence rates from the two surveys combined are presented in greater detail than is possible here.

The data in table 2 reveal three points which are worthy of particular attention. First, there is the high prevalence of disabling illness among males at ages 45 years and over. A higher rate for males than for females has been observed in previous surveys but not for males as young as 45 to 54 years. Second, there is a rather striking excess of disabling illness among

Table 1. Estimated number[1] of persons with a disabling illness or condition in the civilian noninstitutional population, 14 to 64 years of age, by age and sex, United States, February 1949 and September 1950

Sex and date	Numbers of persons (in thousands)						
	14–64 years	14–19 years	20–24 years	25–34 years	35–44 years	45–54 years	55–64 years
	All disabled persons						
Both sexes:							
February 1949	4,569	387	364	650	797	1,044	1,330
September 1950	3,605	225	259	534	618	804	1,167
Male:							
February 1949	2,341	196	150	274	366	566	791
September 1950	2,005	124	118	243	306	426	789
Female:							
February 1949	2,228	191	214	376	431	478	539
September 1950	1,600	101	141	291	312	378	378
	Persons disabled over 3 months at the time of the survey						
Both sexes:							
February 1949	2,300	120	121	260	343	562	893
September 1950	2,206	75	103	266	338	517	909
Male:							
February 1949	1,412	71	73	160	190	338	580
September 1950	1,378	46	61	158	205	293	616
Female:							
February 1949	888	49	48	100	153	224	313
September 1950	828	29	42	108	133	224	293

[1] All figures in this and other tables are estimates from a sample survey and are, therefore, subject to sampling variability which may be relatively large for the smaller figures and the small differences between figures. Each cell of this table was rounded separately; hence, the detail figures do not always add to give the exact total shown.

Table 2. Estimated percentage [1] of persons with a disabling illness or condition in the civilian noninstitutional population, 14 to 64 years of age; by age, sex, race, and marital status for females, United States, February 1949 and September 1950 combined

Sex, race, and marital status for females	Average percentage of persons with a disabling illness or condition, by age						
	14–64 years	14–19 years	20–24 years	25–34 years	35–44 years	45–54 years	55–64 years
Both sexes	4. 19	2. 46	2. 78	2. 58	3. 45	5. 40	9. 38
Male	4. 59	2. 62	2. 50	2. 37	3. 37	5. 89	11. 96
Female	3. 82	2. 31	3. 02	2. 78	3. 52	4. 93	6. 84
Married	3. 45	2. 46	3. 18	2. 33	2. 92	4. 34	6. 16
Not married	4. 70	2. 28	2. 70	5. 35	6. 85	6. 97	8. 18
Both sexes:							
White	4. 03	2. 39	2. 66	2. 46	3. 29	5. 17	8. 97
Nonwhite	5. 77	3. 01	3. 80	3. 93	4. 91	7. 87	15. 00
Male:							
White	4. 51	2. 55	2. 52	2. 34	3. 30	5. 78	11. 59
Nonwhite	5. 42	3. 33	2. 28	2. 71	4. 06	6. 92	16. 88
Female:							
White	3. 58	2. 25	2. 78	2. 56	3. 28	4. 56	6. 41
Nonwhite	6. 07	2. 70	4. 94	4. 87	5. 63	8. 77	12. 96

[1] See footnote 1, table 1.

unmarried women in all age groups from 25 years on compared with rates for married women in the same age groups. This, too, is a relationship that has been observed before, although no completely convincing explanation has been given for it. Finally, a consistent and not unexpected disadvantage of the nonwhite population with respect to disabling illness shows up clearly in the prevalence rates.

The rates in table 2 are based on cases of disabling illness of all prior durations. This means the rates include cases in which the disability had lasted as short a time as one day and other cases in which the person had been continuously unable to work for as long as 10 years, or had even been completely disabled since birth. The rates in table 3, on the other hand, are averages for the two surveys of the percentages of persons aged 14 to 64 who had been disabled for more than 3 months.

For these chronic disabling cases it is apparent that the rates for males are higher than those for females at all ages included in the survey. The ratio of male to female prevalence ranges

Table 3. Estimated percentage [1] of persons in the civilian noninstitutional population disabled for over 3 months at the time of the survey, by age, sex, and race, United States, February 1949 and September 1950 combined

Sex and race	14–64 years	14–19 years	20–24 years	25–34 years	35–44 years	45–54 years	55–64 years
Both sexes	2. 31	0. 79	1. 01	1. 16	1. 67	3. 16	6. 78
Male	2. 95	. 97	1. 26	1. 46	1. 99	3. 75	9. 06
Female	1. 71	. 62	. 78	. 88	1. 37	2. 59	4. 53
Both sexes:							
White	2. 23	. 79	1. 01	1. 09	1. 56	3. 04	6. 43
Nonwhite	3. 15	. 82	1. 01	1. 83	2. 69	4. 37	11. 37
Male:							
White	2. 91	. 98	1. 31	1. 42	1. 94	3. 71	8. 74
Nonwhite	3. 40	. 87	. 69	1. 96	2. 46	4. 15	13. 23
Female:							
White	1. 59	. 61	. 72	. 79	1. 19	2. 39	4. 18
Nonwhite	2. 94	. 78	1. 25	1. 73	2. 89	4. 58	9. 36

[1] See footnote 1, table 1.

between 1.45 and 2.00 in the six age groups shown. In these same six age groups the ratio of male to female mortality from all causes of death ranges from 1.47 to 1.74. In general, there is a noticeable similarity of pattern between the distribution of the disabling illness of longer duration by age, sex, and race and that of mortality in the same groups.

Public Health Monograph No. 4 provides rates for the duration categories in greater detail and also gives average rates of prevalence by employment status and urban, rural nonfarm, and rural farm residence. Tables of sampling errors for use in making rough tests of significance are also presented.

Field work and statistical processing for the two surveys were done by the Bureau of the Census at the request of the Public Health Service, the Social Security Administration, and the Office of Vocational Rehabilitation, Federal Security Agency. A description of the survey, the definitions used, the sampling errors, and other essential features of the data are contained in the references listed here and in the monograph.

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Previous Titles in the Monograph Series

"Estimates of Disabling Illness Prevalence in the United States" is the fourth in the new Public Health Monograph series of the Public Health Service. Previous titles are:

No. 1. A methodology for environmental and occupational cancer surveys. W. C. Hueper, M.D.

No. 2. Tuberculosis in Iceland. Epidemiological studies. Sigurdur Sigurdsson, M.D.

No. 3. Head nurse activities in a general hospital, 1950. Apollonia Frances Olson, R.N., M.A., and Helen G. Tibbitts, M.A.

Beginning with Monograph No. 3, the size of the volumes was standardized. Format of future monographs will be similar to that of Monograph No. 4.

Leptospiral Etiology of Fort Bragg Fever

By WILLIAM S. GOCHENOUR, Jr., V.M.D., JOSEPH E. SMADEL, M.D., ELIZABETH B. JACKSON, A.B., LaRUE B. EVANS, B.S., and ROBERT H. YAGER, V.M.D.

Fort Bragg fever, or pretibial fever, was originally observed during the summer of 1942 in troops in North Carolina. Forty cases occurred that summer, and approximately the same number were diagnosed during each of the next two summers.

The disease, as described by Daniels and Grennan (*1*), was a nonfatal febrile illness of approximately 5 days' duration, associated with headache, malaise, and splenomegaly. The most distinctive feature of the disease was the appearance of an erythematous rash on about the fourth day of illness; this rash was usually limited to the pretibial areas of both legs.

Early Investigations

From the blood of one of the acutely ill patients in 1944, Tatlock (*2*) recovered an infectious agent which induced a fatal disease in hamsters, a mild febrile illness in guinea pigs and rabbits, and grew well in embryonated eggs. By means of neutralization tests performed in hamsters, he was able to show that specific antibodies against the agent appeared in the patients' serums during convalescence. However, various types of studies failed to show that the agent was related to a number of the more common viral and rickettsial agents.

In order to learn more about the disease-producing capacity of the agent in man, in 1946 Tatlock inoculated volunteers with material which had been through 80 passages in the guinea pig and 23 passages in the embryonated egg. The majority of these volunteers, after an incubation period of about a week, developed a mild illness indistinguishable from the naturally acquired Fort Bragg fever.

During the succeeding years, the agent of Fort Bragg fever was maintained intermittently in several laboratories. It was lost occasionally, and in general earned the reputation of being a difficult agent to transmit in serial passage. The possibility that this agent might be a leptospira was considered at several times, but results obtained with methods then employed failed to support the idea.

Recent Methods

Recently a large collection of leptospiral strains was assembled at the Army Medical Service Graduate School for other investigative work. In the fall of 1951, convalescent and immune serums were re-examined with antigens prepared from these strains, and a high level of agglutinating antibody against *Leptospira autumnalis* was demonstrated.

With this lead and the employment of suit-

Major Gochenour is chief of the department of veterinary bacteriology, veterinary division, Army Medical Service Graduate School, Walter Reed Army Medical Center, Washington, D. C., and assistant director of the division; Dr. Smadel is director of the communicable diseases division; Miss Jackson is in the division's department of virus and rickettsial diseases; Mr. Evans is a technician in the department of veterinary bacteriology; and Lieutenant Colonel Yager is director of the veterinary division.

This paper was presented, in part, at the thirty-sixth annual meeting of the Federation of American Societies for Experimental Biology, held in New York City, April 14–18, 1952.

able cultural techniques, a leptospiral organism was recovered from material of the 259th hamster passage of the Fort Bragg agent, which represented the 365th passage in guinea pigs, embryonated eggs, or hamsters since original isolation. Extensive cross-agglutination tests, with hyperimmune rabbit serums, indicated that the Fort Bragg agent was essentially indistinguishable from *L. autumnalis* Akiyami A, the cause of autumnal fever in Japan and the Far East. Both the Fort Bragg and the *L. autumnalis* strains were agglutinated to some extent by antiserums against *Leptospira pomona*, *Leptospira sentot*, and *Leptospira icterohemorrhagiae*. However, none of the antiserums against the remaining 12 prototype strains employed in the screening test studies agglutinated either the Fort Bragg or the autumnalis organism.

At this point there was no doubt that leptospirae of the *L. autumnalis* group were being carried in the laboratory under the designation of the "virus" of Fort Bragg fever. It was then important to establish whether this was a laboratory contaminant or whether it had indeed originated from patients with the clinical disease in North Carolina. We retraced the history of the Fort Bragg agent by means of leptospiral agglutination tests done on stored serums obtained from animals and men infected at various stages during serial passage of the agent.

Test Findings

Dr. Melnick (*3*) supplied paired serums from four chimpanzees which had developed a mild febrile illness following inoculation with the Fort Bragg agent in 1947. The results of his neutralization and our agglutination tests are presented in table 1. All four chimpanzees developed antibodies during convalescence. Neutralization tests were done in hamsters with the strain being carried in 1947 in New Haven, and the agglutination tests employed the Fort Bragg leptospira cultured at the Army Medical Service School in 1951.

The results of agglutination tests on paired serums from Tatlock's volunteers, who had been inoculated in Cincinnati in 1946, are presented in table 2 along with the results of neutralization tests done on hamsters at the school during 1947 and 1948. Here again neutralizing antibodies against the hamster agent and agglutinins for the leptospira were developed.

Table 1. Serologic tests on chimpanzees infected with Fort Bragg agent in 1947

Animal	Hamster neutralization index [1]		Agglutinin titer with Fort Bragg leptospiral antigen	
	Acute	Convalescent	Acute	Convalescent
Rosebud	0	100	0	400
Mary Lou	0	100	0	1, 600
Hickory	0	100	0	1, 600
Catawba	0	100	0	6, 400

[1] Data from reference *3*.

Stored, frozen, paired serums were still available from five of the original soldiers who had been bled during the North Carolina outbreak of 1944. The group included patient A from whose blood the agent of Fort Bragg fever had been originally isolated. The data in table 3 show that patients A, B, and C developed neutralizing antibodies and leptospiral agglutinins during convalescence from naturally acquired Fort Bragg fever. It is of interest that patients D and E, who in Tatlock's experience failed to develop neutralizing antibodies, also failed to develop agglutinins.

Table 2. Serologic tests on volunteers with Fort Bragg fever

Patient	Hamster neutralization index [1]		Agglutinin titer with Fort Bragg leptospiral antigen [2]	
	Acute	Convalescent	Acute	Convalescent
1	0	1, 600	0	25, 600
2	0	400	0	102, 400
3	0	16, 000	0	6, 400
4	0	1, 600	0	6, 400
5	0	1, 600	0	25, 600
6	0	4, 000	0	102, 400

[1] Tests made in 1947–48.
[2] Tests made in 1951.

With portions of convalescent serums, from patients A, B, and E, which had been frozen and stored from 1944 until January 1952, the neutralization tests were repeated, using brain tissue from the 292nd serial hamster passage of the Fort Bragg agent. Essentially the same results were recorded in this test as had been obtained 5 years before by Tatlock using material from early passages of the agent. The data from these tests are summarized in table 4.

Of equal interest are the data in table 4 on neutralization tests with rabbit hyperimmune serums. One of these antiserums was prepared in 1947 from the hamster line of the agent, another in 1951 from cultured leptospirae of the Fort Bragg agent, and the third from cultures of *L. autumnalis* Akiyami A. Each of these hyperimmune rabbit serums protected hamsters against at least 100,000 LD_{50} of the Fort Bragg leptospira. In a similar serum protection test, hyperimmune rabbit serum prepared against *L. autumnalis* Akiyami A completely protected hamsters against subsequent challenge with the Fort Bragg leptospira, which was fatal to all nonimmunized animals.

The results of serologic tests on 45 other stored serums of soldiers ill with Fort Bragg fever are of interest even though paired serums were not available from all patients. Eight of the 24 patients bled in 1943 and 8 of the 21 bled in 1944 presented clear-cut serologic evidence of infection with Fort Bragg leptospira.

Table 3. Serologic tests on patients infected with Fort Bragg fever in 1944

Patient	Hamster neutralization index [1]		Agglutinin titer with Fort Bragg leptospiral antigen	
	Acute	Convalescent	Acute	Convalescent
A	0	100	0	25, 600
B	0	100	0	1, 600
C	0	Equivocal	0	6, 400
D	0	0	0	0
E	0	0	0	0

[1] Data from reference *2*.

Table 4. Neutralization tests on old and new serums with hamster line of Fort Bragg leptospira, 1952

Serum			Neutralization index (log scale)
Species, type	Prepared against	Date	
Patient E, convalescent.	----------	1944	0
Patient A, convalescent.	----------	1944	3. 0
Patient B, convalescent.	----------	1944	3. 0
Rabbit immune	Fort Bragg hamster brain.	1947	5. 3
Rabbit immune	Fort Bragg culture.	1951	5. 3
Rabbit immune	*Leptospira autumnalis* culture.	1951	5. 3

NOTE. Titer of inoculum $= 10^{-5.3}$.

Summary

Recently accumulated evidence indicates that Fort Bragg fever is a leptospiral infection caused by a member of the *L. autumnalis* group closely related to the type strain Akiyami A. Members of this group of leptospirae were not previously known to occur in the United States.

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PHS publications

Genetic Control Of Metabolism

Bacterial viruses insofar as they contain genelike subunits are very much like bacteria or bread mold or men. A discussion of this subject as it relates to the genetic control of metabolic processes is contained in this publication, the first in the series of the R. E. Dyer lectures honoring the former director of the National Institutes of Health.

The author, George W. Beadle, Ph.D., who is from the Kerckhoff Laboratories of Biology, California Institute of Technology, received the Lasker Award in 1950 for his work along this line. Remarks of W. H. Sebrell, Jr., M. D., present director of the National Institutes of Health, who presided, and of James Stevens, M. D., Brig. General, USA (Ret.), and now Dean of the Harvard School of Public Health, who introduced the lecturer, are included in the publication.

In *Neurospora crassa*, the bread mold, many hundreds of specific metabolic defects have been produced through gene mutation. The existence in bacteria, the lecturer said, of mutations similar to the genes of higher organisms, has been demonstrated.

Genes as units of inheritance and of function are discussed. Certain inherited diseases in man suggesting a close relation between genes and protein specificities are:

1. Hemophilia, in which the serum protein of the gamma globulin fraction that plays a role in the blood-clotting mechanism appears to be absent or greatly reduced in its clotting activity.

2. Sickle-cell anemia, in which a defective form of a particular gene changes the electrophoretic mobility of the hemoglobin of the blood cells.

3. Alcaptonuria (to which hereditary idiocy is closely related) in which 2,5-dihydroxy-phenyl–acetic acid is not metabolized, but instead is excreted in the urine.

4. Galactosemia, a hereditary inability to utilize the specific sugar galactose.

The inheritance of diabetes mellitus is not clear. It is probable, nevertheless, the lecturer said, that the continued production of the normal amount of insulin is immediately dependent on the normal form of a specific gene.

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Beadle, George W.: Genetic Control of Metabolism—The R. E. Dyer Lecture, 1951. (Public Health Service Publication No. 142) 1952. 19 pages. 20 cents.

Clean Water In the Missouri?

The Public Health Service, in July 1951, released a 212-page technical report on Water Pollution in the Missouri River Drainage Basin, the third in a series of 15 cooperative State-Federal drainage basin reports to consider the economic and health problems caused by water pollution in major streams and their tributaries in the United States.

"Clean Water in the Missouri?" briefly summarizes the long technical report, and in itself is one of a series of brief reviews of the technical studies.

Written in digest style, the pamphlet is intended for circulation far from the desks of health officers, and, at the same time, it has been planned to achieve basic understanding and to motivate action upon the pollution problems which cut across the boundary lines of city limits and State borders.

Three sample quotations:

. . . "The organic waste being poured into the Missouri and its branches is equivalent to the body wastes and other domestic wastes from 12 million people. About one-third comes from city sewers, the rest from industry."

. . . "From an industrial viewpoint, the waste problem centers about three kinds of industry: beet sugar, petroleum, and packing houses."

. . . "Nearly a thousand urban centers—979 according to the technical reports—are today emptying domestic waste into the Missouri and its tributaries. Only 383 have adequate treatment plants."

The pamphlet points to waste treatment plants as the solution for the pollution of water which has become unfit for drinking, cooking, washing, swimming, fishing, industrial, or farm use.

• • •

Clean Water in the Missouri? (Public Health Service Publication No. 151) 1952. 7 pages; illustrated. 5 cents.

for the general public

Menopause

This leaflet describes the "change of life." The symptoms of the body adjustments taking place during the menopause period are explained. Caution is given against ancient superstitions which have caused unnecessary worry. Consultation with a doctor is advised for guidance through the menopause period in order to assure a minimum of physical and emotional discomfort. The leaflet emphasizes that there is nothing abnormal about the change of life.

• • •

Menopause. Health Information Series No. 15 (Public Health Publication No. 179). January 1952. 1-fold leaflet. 5 cents; $1.50 per 100.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication (including its Public Health Service pubication number). Single copies of most publications can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

Public Health in the Scientific Assembly Of the American Medical Association

Among the several hundred papers presented before the 101st Scientific Assembly of the American Medical Association in Chicago, June 9–13, 1952, there were a number dealing directly with public health topics. With the assistance of the Association, Public Health Reports selected from those papers, available in text or detailed summary form, several which appeared of more than casual importance to our readers. These are presented here in news summary form as a "conference report." The source of each report is stated, and it must be clear that the author—not the Public Health Service—is the authority in each instance.

PHR **Conference Report**

Urges Acceptance of Occupational Medicine

Hoping that his address as chairman would "serve as industrial medicine's declaration of independence," Carey P. McCord, M.D., of the University of Michigan's Institute of Industrial Health, opened the sessions of the section on preventive and industrial medicine and public health.

This integrality, Dr. McCord stated, is necessary as a step toward industrial medicine's full acceptance by the medical profession, whose indifferent attitude he described as fostered by habit and tradition and "one of passive resistance springing from widespread unfamiliarity with the objectives, methods, and obligations of occupational medicine."

"Only the naive will contend that either occupational medicine or preventive medicine has been accorded full and hearty acceptance within the totality of the medical family," he said, in pointing out that the victim of this nonacceptance was not occupational nor preventive medicine but the medical profession and the public.

Centers of Resistance

Dr. McCord "tagged" two loci as "passive resistance centers"—medicine at the average county medical society level and the clinical medical teaching center. "Since medical colleges eventually populate county medical societies," he continued, "possibly there exists but one locus.

"The need is for well-planned, persistent, patient, dramatic, honest instillation of the admirable in industrial medicine into every other segment of medicine," he said. "The onus lies within occupational medicine because of inadequate revealments to other portions of medicine."

To counteract confusion and to gain acceptance, Dr. McCord stated that occupational medicine must establish its identity and individuality. He pointed out that, to some, occupational medicine means just surgery, or but an aspect of public health, or only administration with emphasis on insurance and employment procedures.

"In homely parlance," he said, "occupational medicine has little more identity and individuality than one meaty morsel of good beef stew . . . and needs to leap from the hodgepodge of any beef stew state to the individuality of a good sirloin steak."

"Division" Status

Likening its status to the military division where self-containment is achieved, Dr. McCord claimed the division echelon in the medical world for occupational medicine. "Surgery and other clinical activities as conducted in industry, industrial hygiene, occupational disease control, and administration are but components of an integrality—occupational medicine," he stated.

The preventive medicine of occupational medicine, he stated, is the public health aspects it embraces. "Indubitably, occupational medicine heavily leans upon and profits by the community's organized public health since workers are citizens as well," he said. "Such leanings but reflect the dependence of occupational medicine, like all other branches of medicine, upon the com-

munity's public health protective ministrations to the community. The industrial physician and the public health officer are allies.

"The success of occupational medicine inescapably is linked with community health," he stated later.

Rapport With GP's

In an extension of his remarks, Dr. McCord called for closer rapport and alliance between the family doctor and the industrial physician. Their single objective, he said, was the worker's health, and examination shows there is no basis for any vague belief that in some manner the industrial physician interferes with commendable relations between the family physician and his patient's families.

"The scope of industrial medical activity is such that only those conditions of industrial causation or aggravation and emergencies become the recipients of medical consideration beyond diagnosis or impression," he pointed out. Also, the industrial physician promotes the interests of the family physician by referral of nonoccupational conditions and continually needs the guidance of the family physician in connection with work resumption and work capacity, he declared.

On medical student training, Dr. McCord asserted that "aridity as to preventive medicine runs deep in the sands of clinical medical education . . . the student ends his formal training days more than a little warped in his concepts as to just what is important to an awaiting health-needing world."

New York Study Shows Rehabilitation Pays

Presenting the results of a follow-up study of 208 rehabilitants, Howard A. Rusk, M.D., professor and chairman of the department of physical medicine and rehabilitation, New York University College of Medicine, asserted that rehabilitation of severely handicapped persons pays dividends in dollars as well as in social returns. The study was made 1 year after the discharge in 1950 of the patients from the physical medicine and rehabilitation services of three New York hospitals.

In speaking before the physical medicine section, Dr. Rusk pointed out that an economic gain is made even if the results of rehabilitation are limited to increased self-care. "To teach a helpless person self-care releases other hands and often saves costly care of the individual in an institution or hospital," he said.

Ninety percent of the individuals studied derived some benefit from their rehabilitation experience, Dr. Rusk reported. Eliminating 14 who did not complete their rehabilitation program, this percentage is increased to 97.

Dramatic Results

He stated that the number of patients confined to wheel chairs and beds decreased from 68 percent to 32 percent of the total; the number incapable of even minimal self-care decreased from 65 percent to 15.5 percent; and the number able to do some kind of work increased from 17.2 percent to 67.1 percent.

Dr. Rusk reported that upon admission to the hospitals, only 19 of the 208 patients were employed, or in training for employment, whereas 1 year after discharge 80 were working or in training. Complete figures on the yearly earnings of those now employed were not available, but the economic net gain of 31 and the potential earnings of 18 in training were estimated at $95,800.

Dr. Rusk emphasized that the study highlighted two problems in regard to rehabilitation: (1) providing an opportunity to all disabled men, women, and children for comprehensive rehabilitation training; and (2) closing the gap between rehabilitation and training on the one hand and service and social opportunity in the local community on the other.

"To set these people adrift with their problems in their helplessness is a waste not only of costly training but, more important, a waste of human courage and effort," Dr. Rusk concluded.

Antimicrobial Therapy Aids in Tuberculosis

In the treatment of tuberculosis, antimicrobial therapy has become indispensable and "should be carefully coordinated with other forms of treatment," David T. Carr, M.D., a physician at the Mayo Clinic in Rochester, Minn., told the section on internal medicine.

The older forms of therapy, such as rest, collapse, and excision, still must be used, Dr. Carr explained, but with the discovery of potent antituberculosis drugs, treatment has become more complex and has increased the need for physicians to specialize in pulmonary tuberculosis treatment.

The best regimen available today for most tuberculous patients is streptomycin or dihydrostreptomycin given intramuscularly two or three times a week and daily oral doses of para-aminosalicylic acid (PAS), Dr. Carr said. "Preliminary reports of studies indicate that treatment for a period of 1 year or longer is significantly more effective than for a shorter period," he stated.

The concurrent administration of two or more drugs has been shown to delay, or even to prevent, the emergence of drug-resistant strains of tubercle bacilli, Dr. Carr reported. Such a delay has been effected in the combined use of streptomycin and PAS, but further clinical investigations are needed.

Isonicotinic acid hydrazide, Dr.

Carr pointed out, is now considered to have therapeutic potentialities. He said that to overcome drug-resistant strains "possibly the concurrent administration of all three drugs will prove to be the most therapeutically effective regimen."

Arthritis—"Health Problem of First Order"

Three events within the past 5 years marked the beginning of a new era of medical study and practice in the field of arthritis, declared Russell M. Wilder, M.D., director of the National Institute of Arthritis and Metabolic Diseases, Public Health Service, addressing the section on preventive and industrial medicine and public health.

Describing arthritis and rheumatism as "an enormous drain upon the country's manpower and economic resources," Dr. Wilder said that approximately 7.5 million people in this country are afflicted and that the cost to the Nation is estimated at over a billion dollars a year. He regards the rheumatic diseases as a "public health problem of the first order."

A major step in the advance against arthritis was taken in April 1948, when the two fund-raising groups, the National Arthritis Research Foundation and the Detroit Fund for Crippling Diseases, were merged to form the Arthritis and Rheumatism Foundation and annual fund-raising campaigns on a nationwide scale were initiated, stated Dr. Wilder. The funds of the foundation, now the principal voluntary agency in this field, are used to support laboratory and clinical research, to sponsor professional and public education, and to provide facilities and services for treatment.

Dr. Wilder noted the discovery of the antirheumatic properties of cortisone and ACTH in 1949 as the second event. This discovery produced hope that further research would provide physicians with means for effective treatment, even mass control of rheumatic disease.

Functions of NIAMD

The third event was the establishment of the National Institute of Arthritis and Metabolic Diseases in 1950, Dr. Wilder said. The new institute, superseding the Experimental Biology and Medicine Institute in the National Institutes of Health, is at present carrying out a twofold program: conducting research in the rheumatic and various metabolic diseases, and assisting and fostering research in non-Federal institutions through grants and fellowships. A third phase of the program—clinical investigations in arthritis and the metabolic diseases, such as diabetes—will begin when the new Clinical Center, now under construction, at the National Institutes of Health is completed.

The objective of arthritis research by all official and voluntary organizations, Dr. Wilder concluded, is to help physicians help their patients.

Periodic Check-ups Urged for Smokers

Because of the higher incidence of lung cancer among heavy smokers than nonsmokers, semiannual radiological examinations for every heavy smoker over 45 were urged by J. Winthrop Peabody, professor of respiratory diseases at Georgetown Medical School and chairman of the section on diseases of the chest. This might lead to detection of the disease in the operable stage, he said. "Until this is done, mortality will continue high."

A definite diagnosis of lung cancer is now possible in 85 percent of the cases even in the early stages, he stated.

Antibiotics, he pointed out, have produced the greatest change in the treatment of pulmonary disease, adding:

"They serve as valuable adjunct therapy to the old proved methods, such as bed rest, proper diet, and collapse theory in tuberculosis, and have shortened the recovery period. Complications have been reduced in number and severity, and operations performed on patients formerly considered inoperable."

Prevention, early recognition, and therapy, he reported, have made a decided advance against tuberculosis, pneumonia, lung cancer, and other chest diseases.

During the last decade, Dr. Peabody said, radical changes in the treatment of chest disease have been brought about by the use of antimicrobial drugs, new surgical techniques, and improved methods of anesthesiology. Mass chest surveys have also proved of great value in the fight against tuberculosis.

Museum Advances Patient Education

Sixty thousand yearly visitors attests the progress the Cleveland Health Museum has made in patient education, Bruno Gebhard, M.D., director of the museum, told the section on preventive and industrial medicine and public health. This number represents a doubling in attendance since the program began 12 years ago. Membership, too, has risen from 800 in 1940, mostly doctors, to 2,200 now, including people in all walks of life, he reported.

Although physicians fear self-diagnosis on the part of their patients, Dr. Gebhard thinks that it always has been and always will be the patient who makes the first "diagnosis" and that it is the educated patient, steered by his physician, who is most likely to make the right one. People born with certain tendencies, he maintained, will become hypochondriacs with or without

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health education; honest health education releases anxieties and encourages a more optimistic outlook.

Pointing out that "doctor" originally meant "teacher," Dr. Gebhard declared that the best education is from one person to another in a heart-to-heart talk, that is, from physician to patient. "Making the patient feel a participant," is accomplished primarily, he said, by talking things over and doing things together. Talking to patients is just as important as writing a prescription, he maintained.

Group Teaching

As a new approach to the frequently mentioned barrier between the physician and his patient caused by medical technology, Dr. Gebhard reminded physicians that since they were individuals who had lived and talked as men, it ought not be asking too much for them to remember these facts when they deal with men.

The advantages of group teaching have long been known to educators, Dr. Gebhard reminded his audience, and physicians are today making more and more use of this active "learning-participation." He noted particularly the educational meetings held for the subscribers of the Health Insurance Plan of Greater New York, described in the *Montefiore Hospital Medical Group Bulletin* as follows: "It is unlikely that patients and doctors anywhere have been drawn so close to each other that questions regarding the detail of practice, the relations between doctor and patient, and even the income of doctors, have been so freely asked and freely answered."

Hospital patients, Dr. Gebhard said, should get special attention regarding information about their ills and their health care. "Patient education in hospitals has to be carried on in an organized fashion; the modern hospital cannot leave it to the chance action of doctors and nurses."

Visual Aids

Dr. Gebhard emphasized the use of visual aids, as one of the media for patient education—pictures, charts, actual physical models. This medium is used extensively in the Cleveland Health Museum, he noted, but it may also be used in the doctor's office, in group teaching, and in the hospital.

In addition to visual forms of education, Dr. Gebhard reported that the Cleveland Health Museum uses radio and television programs, newsletters, and booklets.

"The content of patient education has a great scope," Dr. Gebhard stated. "Today, in developing the Cleveland Health Museum, we center our thinking around the normal growth and development of the human life from birth to old age." Most people are healthy most of the time, and it is better health that people want, he maintained, not just being free from disease. "One of the underlying goals of the Cleveland Health Museum's many and varied activities," he commented, "is perfect understanding and faith between doctors and their patients." For this reason, he said, museum exhibits go beyond biology into personal health, with special emphasis on the "positive" rather than on the "negative" side of living.

Travel Spurs Interest In Tropical Diseases

Citing reasons for the increasing interest in the control of tropical diseases, Lowell T. Coggeshall, M.D., dean of the division of biological sciences at the University of Chicago, told the general scientific session, "Modern transportation is now capable of carrying within a matter of hours an ever-increasing number of visitors into some of the most unhealthful spots on the globe."

Dr. Coggeshall stated that it is possible for some travelers to enter a tropical area and return before the normal incubation period of a disease has elapsed. He pointed to the misconception that tropical diseases occur only in the tropics.

"Our industrial and business interests are increasing in foreign areas, and, with their development, a large number of highly susceptible individuals are constantly coming and going," Dr. Coggeshall said. "Further and more important," he added, "international commitments would seem to make our interest in tropical diseases a permanent rather than a temporary episode."

American physicians and health officers can expect to see more of the diseases which have been considered rare in this country, according to Dr. Coggeshall, because of the rapid turnover of American troops in Korea and the frequent trips of Americans into some of the most insanitary areas of the world. For these reasons, the American physician and health officer need "to keep more familiar with the advances being made by the scientists."

Dr. Coggeshall contrasted the great progress of today in the control of malaria, the rickettsial group, and plague with conditions of 15 years ago when there were practically no investigative programs. Tuberculosis, he added, because of its peculiar manifestations in the tropics, would seem to profit most if the recently discovered drugs prove to possess the therapeutic values now visualized. He mentioned that research projects are being conducted in many areas of the world by the medical departments of the armed services, pharmaceutical houses, foundations, and universities.

Several other tropical diseases which Dr. Coggeshall listed as menacing to the visitor to hot countries are schistosomiasis, filariasis, and leishmaniasis—diseases caused by infestation of tiny parasites in the blood or tissue.

The Public Health Service's New Clinical Center for Medical Research

Shown above is the Clinical Center now under construction on the grounds of the National Institutes of Health, Public Health Service, at Bethesda, Md., a suburb of Washington, D. C. This view shows the rear (southern) facade of the 500-bed research hospital scheduled to begin operation in April 1953. To the left are service buildings. To the right are two of the present laboratory buildings of the National Institutes of Health.

The center will provide the usual resources of a modern general hospital, including ancillary services such as physical medicine and rehabilitation, medical and psychiatric social work, recreational therapy, and spiritual ministry. Instead of the usual out-patient department, a follow-up service will work with returning patients and carry out special studies involving examination of normal controls, ambulatory patients, and similar functions directly related to the research program.

50 Years' Experience Focused on Chronic Ills

The experience of more than half a century of laboratory and clinical research by the Public Health Service is being brought into focus by the development of the Service's new clinical center for medical research, Norman H. Topping, M.D., Assistant Surgeon General and associate director of the National Institutes of Health, told the 101st Scientific Assembly of the American Medical Association in Chicago on June 9, 1952.

Now nearing completion and scheduled for admission of patients next April, the Clinical Center is a 500-bed hospital with a space ratio of about 2 to 1 in favor of laboratory and research facilities. The Congress, by unanimous vote, authorized the center in 1947.

Changing Research Concepts

Dr. Topping characterized the inter-relationships between clinical medicine and medical research as one of the most intriguing chapters in the history of medicine. "They have never been separated," he said, "but the ways in which they have affected each other, the interest of the laboratory man in clinical problems, and the interest of the clinician in investigation have differed quite markedly as medicine has evolved in this country."

Few people would claim that clinical medicine and research are now related in an ideal way, Dr. Topping observed. "Within the laboratory," he said, "specialization has proceeded to the point where the synthesis of ideas across the boundaries of limited fields is becoming difficult. At the same time, the observations and investigations of clinicians are sometimes deficient because the basic requirements of sound research are not or cannot be observed."

2:1 Research-Patient Care Ratio in 500-Bed Unit

"Laboratory and clinical research is no longer the relatively simple combination of a scientist with the itch to solve a problem, plus a couple of dieners, a few animals, chemicals, test tubes, microscopes, and bunsen burners," Dr. Topping remarked, pointing out that more often in research projects today the principal investigator must have the continuous help of a pathologist, a biochemist, a pharmacologist, and perhaps even statisticians and physicists.

The collective judgment of several specialists—both clinical and laboratory—often is needed to formulate reasonable hypotheses, design experiments, and interpret findings. Dr. Topping noted that in addition,

Continued on page 822.

Selection and Study

. . . outline of a hypothetical clinical laboratory investigation of hypertension

To point up more clearly the patient selection and study procedures expected to apply in the new Public Health Service Clinical Center for medical research, Dr. Topping described a hypothetical study to his AMA listeners.

"Let us assume," he said, "that the research staff of the National Heart Institute decides to undertake a long-term study of hypertension with two main objectives: to determine the fundamental causes of this state, and to find better therapeutic agents or procedures.

"A study like this would require regular treatment and observation of the individual over a period of several years. Patients would therefore be selected from stabilized families residing in nearby areas of Maryland, Virginia, and the District of Columbia. The criterion set by the principal investigator might be that of active males between ages 30 and 40, normal in every way except for early symptoms of hypertension.

"Letters describing the study and the admission criteria would be written to the deans of medical schools, hospital directors, and individual cardiologists," Dr. Topping explained. "In this way perhaps 50 patients would become participants in the study, with their first admissions to the center staggered over a 6-month period. At first admission each patient would receive a very complete diagnostic work-up. Thereafter at regular intervals, perhaps every 6 months, patients would be readmitted for observation or therapy. This might occur on a Friday night with discharge on Sunday night, so as not to interfer with the patient's normal work routine.

"Half of these patients might receive one of the new drugs, such as veratrum alkaloids, which have the capacity to lower blood pressure without reducing cardiac output. The other half might be treated also with a sound and practical form of psychotherapy—also believed to reduce blood pressure. Long-term results of the two regimens would be observed and compared.

"The psychiatric studies and treatment would be given through arrangements with the National Institute of Mental Health," the associate director of NIH said. "Regular psychiatric and psychological examinations would also be given to all patients as part of the study of the natural history of hypertension. Clues might thus be obtained to the old problem of which came first: hypertensive disease or the hypertensive personality? Conceivably, one might try to define the basic hypertensive personality and attempt by therapy to modify it. It should also be possible by these means to detect and evaluate the general physiological impact of serious emotional disturbance.

"Similar collaborative studies might be arranged with the Arthritis and Metabolic Diseases Institute in order to obtain information on the interrelationships between metabolic patterns, obesity, hypertension, and psychological states," he noted.

Dr. Topping concluded his description of this hypothetical study by pointing out that "in all studies full reports on each patient will be given at suitable intervals to the referring physician or institution, and the receipt of similar pertinent reports will be welcomed. Active collaboration between the patient's own physician and the Clinical Center staff will be essential for interim therapy and observation. Referring physicians will be welcome to the center and to confer with the appropriate staff members and consultants."

Details of the Physical Plant

This building is a set of laboratories wrapped around a 500-bed hospital. The patients will be located on the south side, usually with 13 two-bed wards in each nursing unit and with two nursing units on each typical floor—one on either side of a solarium.

On the north side, immediately adjacent to the patient area, are the clinical research laboratories concerned with the investigation of problems directly related to the patients.

Between the patients' rooms and the clinical investigation area is a central bank in which various patient services are located, including a kitchen on each floor and a dining room for ambulatory patients.

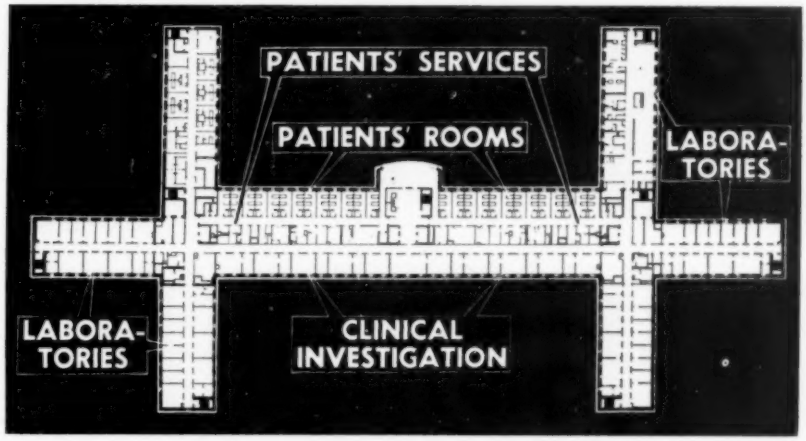
Basic science laboratories are situated in the six wings. Here the fundamental work in each of the major programs will be conducted. Corridors are arranged so as to separate completely the traffic involved in research activities from patients and the patient-care staff.

There will be a chapel, auditorium, post office, bank, cafeteria, and other facilities for the convenience of patients, whose average stay is expected to be considerably longer than in most hospitals.

The 500 beds have been allocated tentatively among the National Institutes as follows: Heart, 104 beds; Cancer, 126 beds; Mental Health, 98 beds; Arthritis and Metabolic Diseases, 78 beds; Neurology and Blindness, 42 beds; Microbiology, 52 beds.

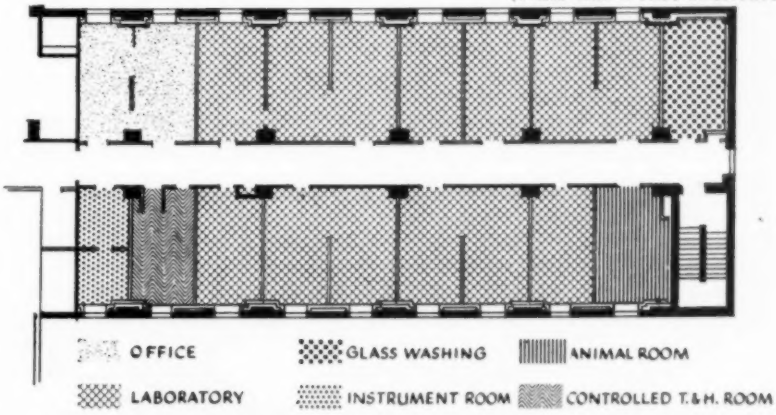
An entire laboratory wing has been specially designed and equipped for research and therapy utilizing various forms of radiation.

Typical Floor Plan of Clinical Center

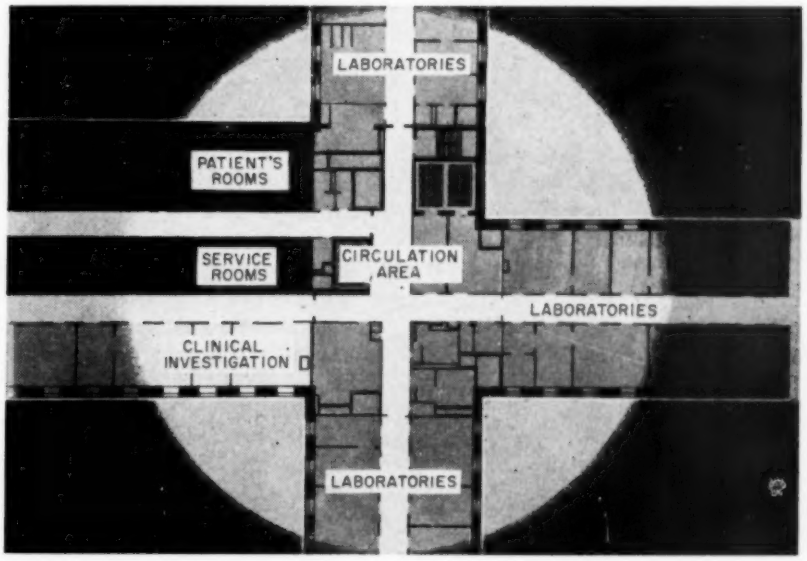


Arrangement of a Laboratory Wing

(National Heart Institute)



Juxtaposition of Clinical and Laboratory Areas



Continued from page 819.

expensive and complicated equipment may be required, citing the mass spectrometer and the electron microscope as examples of equipment which require other especially trained workers to operate and to interpret the findings.

"One of the major challenges of medicine in the years ahead will be to work out the mechanisms, viewpoints, and relationships that will permit the abundant clinical and laboratory talent of the Nation to work most productively for the welfare of man," Dr. Topping maintained. The Public Health Service "looks forward to continued, active participation in this effort," he said.

Selection of Research Problems

Selection of problems for study will be guided, Dr. Topping declared, by a principle long observed at NIH. This "holds that scientific research flourishes and is productive only in an atmosphere of intellectual freedom. Therefore, the acceptance or selection of problems for investigation, the design of the experiment, and the methods to be employed are the prerogative of responsible staff scientists free from pressure, authoritarian direction, or control from above or outside.

"In addition to basic studies in clinical medicine, much of the clinical work at the center will be for the purpose of obtaining clinical evaluation of findings emerging from fundamental laboratory investigation," he said. Other clinical studies undoubtedly will attempt to validate promising new procedures involving small numbers of patients treated elsewhere.

Dr. Topping went on to say that research in fields other than medicine and biology is contemplated under the plan. These would include such subjects as more effective techniques of hospital administration; maximum utilization of subprofessional nursing and physical therapy skills; refined techniques in varied fields, such as sanitary engineering, safe disposal of radioactive wastes, food and garbage disposal, and similar problems.

Dr. Topping, continuing, pointed out that each research patient will be given as good medical care as he would receive in the Nation's best general hospitals. The details of patient care procedures, the physical arrangements, numbers and kinds of physicians, nurses and technicians, and the facilities at their disposal have been worked out with this goal in mind.

Research History of PHS

Dr. Topping traced the experience of the Public Health Service in laboratory and clinical research "in the modern sense" from its beginnings in 1887 when Dr. Joseph J. Kinyoun established one of this Nation's first bacteriological laboratories.

He noted major contributions of PHS scientists in the diagnosis, treatment, or prevention of such diseases as yellow fever, pellagra, tularemia, hookworm disease, St. Louis encephalitis, dental caries, liver cirrhosis, atypical pneumonia, epidemic conjunctivitis, Rocky Mountain spotted fever, trichinosis, Q fever, brucellosis, malaria, and typhus.

With the years, the Service has been given more and more research assignments. In 1937 the Congress gave official cognizance to public and professional interest in chronic disease when it created within the Public Health Service a National Cancer Institute. This interest continued after World War II, which—as Dr. Topping pointed out—"while temporarily delaying further expansion of basic medical research, proved that fundamental research not only in nuclear energy and electronics but in the medical and biological sciences as well, paid enormous dividends."

In addition to research in its own laboratories—which have expanded substantially since the war as the result of Congressional action—the PHS, as the agent of the people through the Congress, is now supporting a substantial volume of clinical and laboratory research in the universities and medical schools of the Nation, Dr. Topping reported.

Reviewing the mechanism of the research grants program and the crucial role of National Advisory Councils and the study sections (see *Public Health Reports*, June 1952, pp. 596–597), the Assistant Surgeon General said that the Service was "fully conscious of the heavy responsibility which has been placed upon us to administer these funds in a way that will preserve and enhance the freedom of the investigator and his institution, which is a cornerstone of scientific progress."

Basis of the Center

In the early days of PHS medical research, the associate director of NIH recalled, "the laboratory served mainly as an adjunct to observations and analyses made at the bedside of sick people. In more recent years, when we began also to study cancer, cardiovascular diseases and other long-term illnesses, the state of knowledge was such that extensive fundamental laboratory study was emphasized. It soon became apparent, however, that clinical facilities also would be needed."

Thus, Dr. Topping reported, the Surgeon General appointed a committee to study the question. One of the first conclusions reached by this committee was that a separate research hospital for each class of disease would be wasteful of money and scarce manpower. "Even less desirable would be separation of clinical study into many narrow compartments in the face of a growing realization that different disease entities, different body systems and different fundamental biological phenomena were far more intimately interrelated than had been suspected," he said.

Congressional authorization in 1947 was followed by a year of extensive consultations with clinicians, investigators, hospital administrators, and laboratory designers from other institutions.

"Finally, in 1948, we had evolved a plan which seemed to reconcile the practical with the ideal," Dr. Topping said, "It was a laboratory-hospital building which would allow laboratory investigators and clinicians to work in close physical and intellectual proximity. The main elements of the plan were a physical layout that could encourage free interchange of ideas, plus utility and flexibility to meet the ever-changing requirements of laboratory research, patient care and administrative practices." (For details of the physical plant, see p. 821.)

Use of New Drug As TB Retardant

Streptomycin and isonicotinic acid hydrazide can be used to supplement each other as retardants of germ growth for limited periods during the medical treatment of tuberculosis, Harry J. Corper, M.D., director of research for the National Jewish Hospital at Denver, Colo., told the section on pathology and physiology.

Such retardants are not in themselves cures for tuberculosis, since they have not been demonstrated to destroy the tubercle bacillus in vivo efficiently or within reasonable time, Dr. Corper said in depicting their usefulness as a "notable advance" in research which should encourage the search for more efficient agents to combat the tubercle bacillus.

Although these agents are valuable adjuvants to the regular regimen of tuberculosis therapy, Dr. Corper cautioned against using them if progress is possible without them. He pointed out that the tubercle bacillus is an exceptional micro-organism among disease-producing germs because it can survive under adverse biological conditions and is able to adapt itself to most antibiotics and chemical therapeutic agents within a relatively short time, both within the body and in a test tube.

Dr. Corper also cautioned against hurried conclusions as to the effectiveness of a drug against the tubercle bacillus because the germ does not readily reveal its intimate protective properties and is able to build up a resistance which lasts for years.

Poliomyelitis Treatment Programs Outlined

The treatment modalities that physical medicine and rehabilitation offer the poliomyelitis patient today are physical agents, therapeutic exercises, and mobilization techniques, Duane A. Schram, M.D., of Gonzales, Tex., told the section on physical medicine and rehabilitation. He remarked that the various treatment programs used throughout the United States are basically similar.

In describing the physical agents, Dr. Schram pointed out that although various types of heat and even drugs have successfully alleviated muscle pain and tenderness in selected cases, consistently good results obtained with the use of moist heat in the form of hot packs have established this method. Recently, the lay-on pack has replaced, to a considerable degree, the conventional wrap-around pack. Hydrotherapy is also used, he added, but generally only in the subacute stage, when the patient can be transported.

Daily electrical stimulation of affected muscle groups will, according to certain claims, not only prevent atrophy but also augment exercises in re-education and strengthening, Dr. Schram continued. The use of a variable frequency generator, which permits the finding of the optimal frequency in which to stimulate any given muscle group, is a recent development in this technique.

Rehabilitation Techniques

Early in the postacute period an attempt is made to elicit active voluntary control in the affected neuromuscular units, Dr. Schram stated. Advocated techniques include synkinetic movements and positional and stretch reflexes. Regardless of claims for particular types of stimuli, Dr. Schram noted, the problem is primarily one of establishing a situation in which an undistracted, cooperative patient is treated by a skilled therapist using the type of stimuli necessary to accomplish the desired result.

Although a patient may gain some degree of strength on a muscle re-education program, Dr. Schram maintained that more efficient methods can be used after coordination is well established. By using apparatus in exercise, it is possible to record and control the resistive forces used. When the gains in strength begin to diminish, the exercise is gradually changed to one of function; the patient is taught self-help and practical activities with whatever available residual strength he has left.

Mobilization Techniques

Mobilization techniques represent an attempt to attain or maintain normal body alinement, Dr. Schram said. Early in the course of the disease, passive motion is administered to maintain joint mobility and if there should be a mild contracture of a segment, active stretching is indicated. If the contracture or tightness is more than mild, apparatus is often used. Dr. Schram stressed the fact that the apparatus must fit perfectly and that the tolerance of the patient to traction should be guided by the resistance

of the soft tissue to pressure and the adaptability of the patient to the program. The length of time in traction is gradually increased to whatever regimen is required for adequate results.

In conclusion, Dr. Schram emphasized the necessity for all these modalities of treatment to be prescribed with judgment and executed with dexterity. Frequent evaluation is also necessary to emphasize the treatment measures of choice as the patient proceeds in the over-all program.

ACTH and Cortisone In Clinical Medicine

Completing 3 years of study, Laurance W. Kinsell, M.D., Oakland, Calif., thinks it probable that ACTH and cortisone have a true place in clinical medicine—a place to be more accurately defined in the next several years.

Dr. Kinsell reported to the section on general practice on the studies he and his associates are conducting at the Institute for Metabolic Research, Highland-Alameda County Hospital in Oakland.

As of today, ACTH-cortisone may be safely used to return a large number of chronic disease invalids to full activity, according to Dr. Kinsell. Particularly does this apply, he believes, to patients with rheumatoid arthritis and bronchial asthma. Most of these patients, however, will still need many years of continuous hormonal therapy.

"Despite the lack of true curative effect of the hormones," Dr. Kinsell observed, "administration of a sufficient amount to patients with rheumatoid arthritis and with bronchial asthma will result in complete disappearance of all signs and symptoms of the disease in almost 100 percent of the patients. If dosage is maintained at a sufficient level, the remission will be maintained indefinitely."

Ideal Therapy

This procedure has been followed at the Institute for Metabolic Research, he reported. Although admitting that the "ideal therapy in any disease state is treatment which will totally eradicate the causative agent," Dr. Kinsell and his co-workers have found ACTH-cortisone therapy preferable to the "super-aspirin" approach.

Dr. Kinsell remarked that before the advent of ACTH-cortisone many able and conservative rheumatologists considered aspirin the most valuable single pharmacological agent.

Any treatment presently available for both rheumatoid arthritis and severe nonspecific bronchial asthma, Dr. Kinsell said, is less than ideal because the precise development of the diseases is poorly understood.

Among the patients treated in the ACTH-cortisone studies is a group with diseases for which the mortality rate is high, Dr. Kinsell reported. Their "almost certainly fatal outcome appears to have been postponed indefinitely," he said. One of these had been ill with pemphigus for approximately a year before receiving ACTH-cortisone therapy. Therapy was discontinued 2 years after commencement. No signs or symptoms of the disease have recurred.

Dr. Kinsell discussed another group of studies in which ACTH-cortisone was given to patients with severe infections who had failed to respond to antibiotic therapy. Their improvement was striking.

"It is mandatory," Dr. Kinsell emphasized, "that all patients with infectious diseases, receiving ACTH and cortisone, shall also receive intensive antibiotic therapy prior to, during, and following the hormonal therapy."

Dr. Kinsell added that there were measures to be considered in preventing the "untoward" effects of ACTH-cortisone therapy. One of these is a dietary program, high in protein and potassium and low in sodium and carbohydrate.

Mass Chest Surveys Urged in Industry

Industry provides an excellent setting for mass chest X-ray screening programs, O. Merton Derryberry, M.D., director of health, Tennessee Valley Authority, Chattanooga, Tenn., stated before the section on preventive and industrial medicine and public health.

He pointed out that the long-term relation between the employee and his plant health service affords opportunity for carrying out the pre-survey and follow-up activities necessary for an effective mass screening program. A high percentage of participation can be obtained; suspect, positive, or indeterminate findings can be followed up conveniently, effectively, and economically; there is reasonable assurance that treatment will be received since both medical guidance and the assistance of employee welfare associations are available; and opportunities for rehabilitation can be worked out.

Dr. Derryberry suggests that, in view of these advantages, industry may prove to be a valuable testing ground for the newer technique, the multiple screening survey.

TVA Survey Cited

To demonstrate the industrial aspects of mass X-ray screening surveys, Dr. Derryberry cited results of the surveys conducted among Tennessee Valley Authority employees. From 1943 through 1949, these surveys were organized and conducted and the follow-up initiated by TVA personnel. From 1950 through 1952, mobile units of official health agen-

cies made the X-ray examinations, but TVA personnel continued the presurvey and follow-up activities.

A total of 76,358 films were made by the TVA unit from 1944 through 1949, Dr. Derryberry reported. Employee participation ranged from 71 to 90 percent. Films read as abnormal ranged from 1.3 to 6.2 percent, the lower percentage occurring with the use of stereoscopic 70-mm. film, which replaced the 35-mm. stereoscopic photofluorograms in 1948. Films read as showing reinfection tuberculosis ranged from 0.6 to 3.5 percent. Other chest abnormalities were found in from 0.6 to 3.4 percent of the films.

The results of the surveys using the official health agency equipment approximated closely those obtained with TVA equipment. "There is no doubt, however," Dr. Derryberry said, "that lessons learned from development and execution of a complete and self-contained TVA chest screening service over a period of several years facilitated TVA's effectively using the results of mass screening provided by the official health agency."

Mobile Unit Planned

The effective application of mass chest X-ray screening led to consideration of multiple screening as a tool of preventive medicine, Dr. Derryberry continued. During the past year, a pilot study at one TVA project produced out of 651 employees screened, 320 who had abnormal health conditions for which corrective action was advised. Plans are now under way to adopt the technique to use in a mobile unit which will visit some 60 scattered locations where approximately 5,000 employees are located, and also to organize similar services at one or more permanent locations.

Industrial medical services, Dr. Derryberry concluded, are strategically placed in the relationship between employee and the practicing physician and can play a leading role in the progression from case finding, through diagnosis, follow-up, and treatment, to rehabilitation.

The Physician's Use Of Psychotherapy

Physicians need not be psychiatrists to apply psychotherapy to psychosomatic disorders in the opinion of Bernard I. Lewis, M.D., department of internal medicine at the State University of Iowa, College of Medicine, Iowa City, Iowa.

"Patients cannot but benefit when their total illness is competently treated," Dr. Lewis told the section on internal medicine.

"There is no substitute for a valid diagnosis," Dr. Lewis declared. "The basic requirements for a positive psychosomatic diagnosis demand that the manifestations of the particular illness should be characterized by an onset, sequence, nature, and course which suggest disturbed psychophysiological function. The physical and laboratory findings should disclose no pertinent structural lesions or organic disease . . ."

Data From Histories

When this is true, Dr. Lewis suggests looking for the stressful life situation or internal conflict which is currently providing the patient with significant difficulty. The impact of this stress should eventually be correlated with the onset and perpetuation of the present illness. The patient's response to this situation should reflect, physiologically, his unresolved dilemma, or partial but unsatisfactory solution of the problem.

In pointing to a method for obtaining necessary information to satisfy diagnostic requirements, Dr. Lewis reported he had found the standard history and physical examination routine satisfactory. The routine, however, should be "modified elastically," he added, "to suit the individual patient and bolstered by a few concepts borrowed from our psychiatric colleagues. As emotional disorders are usually reflected in many spheres of activity, important information may be garnered from a survey of the patient's social and vocational history, family relationships, and marital adjustment."

Dr. Lewis emphasized the point that the physician's attitude is all-important in gaining this information. He described the art of observant listening and indirect control of the patient interview as far more valuable than a barrage of leading questions. "The physician's receptive and noncritical attitude plays the vital role in encouraging the patient to divulge facts and feelings of the past which may have important bearings on the present," he commented. "By the use of subtle indirection, an amazing mass of material may be obtained within the framework of the orthodox medical history and within a relatively short period of time."

The Physical Examination

The physical examination will provide the opportunity to detect any objective evidences of such significant emotional dysfunctions as fluctuating changes in skin color, temperature and moisture, vasomotor lability with fluctuating heart rate and blood pressure. "Gross inspection will commonly detect general patterns of significance such as excessive anxiety, tension, depression, or an inappropriate pseudocalmness," he said.

At this point, with complete knowledge of the patient—his past history, characteristic reaction patterns, and current life situation—Dr. Lewis said that the physician is ready to delineate the genesis of the present illness, its underlying purpose, and its more superficial meaning to the patient.

Subsequent therapy can now be planned, he said. The physician may decide whether his diagnosis calls for immediate psychiatric referral or whether he can undertake therapy himself, he said in emphasizing that the keystone of the therapeutic process is the doctor-patient relationship.

Dr. Lewis believes that the nonpsychiatrist can undertake the "suppressive or covering" form of psychotherapy. More superficial than therapy which requires skilled personnel and specialized methods, suppressive therapy can be very effective, he stated. It functions in two areas: manipulation of the patient and manipulation of his environment. Dr. Lewis concluded:

"Superficial insight into the relationship between his emotional problems and physical symptoms with appropriate, simplified explanation of the underlying mechanisms will give the patient additional understanding and frequently dissipate many of his fears. When he appreciates that these disorders are extremely common—that everyone has a tolerance level beyond which he will break—the patient will no longer regard himself as a defective specimen and will tend to regain his self-esteem. In conjunction with these direct efforts, it is often necessary to effect certain environmental changes so as to minimize the stressful factors impinging upon the patient. For this purpose, the relatives or employers should be consulted and their cooperation secured. Similarly, the services of various social agencies should be utilized."

State Health Services Dispersal Continues

In the past decade, dispersion of health functions throughout the structure of State government has gone on apace, Jack C. Haldeman, M.D., chief of the PHS Division of State Grants, told the section on preventive and industrial medicine and public health at the Chicago AMA meeting on June 12.

Reading a paper largely prepared by the late Dr. Joseph W. Mountin, he said that the current study reveals: "First, a maze of official agencies in each State, with wide scattering of responsibilities for health programs throughout the maze; second, a State-to-State difference in the configuration of agencies responsible for specific functions; third, State-to-State variation as to degree of responsibility for those functions."

The data presented were based on the 1940 and 1950 decennial surveys of State health organizations made by the Public Health Service. "The interest of the American Medical Association may be assumed," Dr. Haldeman noted, "since the first comprehensive survey of State health departments was made under the auspices of your association, by Dr. Charles V. Chapin in 1915."

60 Types of Agencies

For the Nation as a whole, exclusive of organizations differing in name only, there are 60 distinct types of State agencies carrying health functions, Dr. Haldeman reported. In 1940 there were 48 types. The maximum number in any one State in 1940 was 18; today it is 32.

Attempts at integration are, however, being made, Dr. Haldeman said. He mentioned water pollution control, school health services, and tuberculosis sanatorium direction as examples.

Dr. Haldeman believes that "the steady extension of interest in health matters reflects not only general public enlightenment but also the decade's advances in scientific knowledge and resources. Moreover, medical advances have simplified or eliminated many of the earlier public health problems—leaving elbowroom for State health and other agencies to branch out into new fields and ideas."

State Activity Progressive

"From this standpoint," he continued, "State health activity is progressive. More than half of the programs in the current survey are carried on in all the States and Territories by at least one official State agency. This degree of responsibility among the States did not exist in 1940, when less than one-third of the programs were carried out in each of the States. Today, the only activities in which fewer than three-fourths of the States participate are some of the newly established chronic disease programs, hygiene of housing, human blood and blood derivative programs, and health services for migratory labor."

Some progress has been made in concentrating the older and better established programs within health departments, Dr. Haldeman reported. "Nevertheless, our findings indicate that too many areas have failed to utilize—especially for the more recent programs—the extensive authority, the technical skills, and the basic interest in total health available in the health department. Organizationally speaking, the new functions appear to have been fitted into or tacked onto the administrative framework of State government without system or design."

Health Expenditures $1 Billion

Turning to fiscal aspects, Dr. Haldeman reported total health expenditures for preventive services, hospitalization, and medical care provided by the 48 States in 1950 as approximating one billion dollars—about three times the 1940 level of expenditures.

"Of the current total," he reported, "74 percent was State appropriated; 15 percent was derived from Federal grants—of which more than half was for the school lunch program; 1 percent was furnished by local gov-

ernments; and 10 percent came from other sources."

The total per capita figure was $6.30, ranging from $3.26 to $13.58. State health departments are responsible for only one-sixth of the aggregate expenditure. Welfare departments account for another one-fifth; educational authorities, for one-tenth. About 55 percent are for hospital expenditures, usually not the responsibility of State health departments, Dr. Haldeman noted.

"In the fiscal year 1949, the 48 State health departments spent nearly $160,000,000," he reported. State-appropriated funds amounted to more than two-thirds of this total. A decade ago this proportion was less than three-fifths.

Local Initiative Growing

"This contradicts," Dr. Haldeman felt, "the claim sometimes made that Federal aid dries up local initiative. During the 10-year period, total per capita expenditures by State health departments increased by more than 200 percent, while the increase for the median State amounted to 183 percent." He noted that about half of the increase reflected rising prices, but "the remaining half reflects, to a considerable extent, true expansion of program."

The reports indicate an increasing delegation of health activities and funds to local areas, Dr. Haldeman commented. "To me, this is clear-cut evidence of the dynamic quality of Federal-State, State-local relationships."

State health personnel of all types have increased by two-thirds during the decade—from 16,000 to 26,000 full-time personnel. The majority are State health department employees. Dr. Haldeman noted advances, plus wider disparity in operation, of merit system units. He also commented on the tendency of salaries to fall behind cost-of-living advances.

Training of public health workers has now become an important part of State health work, Dr. Haldeman reported. Some types of training are now offered in 49 of the 53 State and Territorial jurisdictions. In 1950, some 11,000 persons received training offered by State health departments, as compared with about 850 in 1940.

Orientation Too Narrow

In concluding the paper for himself and Dr. Mountin, Dr. Haldeman declared:

"It is difficult to escape the conclusion that the desire for health is a compelling urge in American life, but as yet insufficient leadership has emerged around which the separate forces will rally. Possibly the strength of the movement lies in its many sources of origin. Possibly it is too early to channelize this tide, the depth and breadth of which cannot be measured. We of traditional public health and medical background naturally had hoped that the State health department might be the coordinating, if not the integrating, mechanism in the States. But I fear its current orientation is too narrow.

"That which was presented in 1940 as a plea must now be regarded in stronger terms," Dr. Haldeman continued. "Today it is even more imperative that maximum efficiency of organization and cohesive action be obtained, if full advantage of all the technical developments currently at our command is to be realized. No matter from whose viewpoint the issue of overlapping health services is approached—from that of the economist, the business man, the administrator, the physician, or the consumer—there is little to recommend it."

Step Up Program of TB Case Finding

Although the disease is still the leading cause of death among the group 17 to 37 years of age, Arthur C. Christie, M.D., of Washington, D. C., told the military medicine section, mortality from tuberculosis has fallen to 33,557 in 1950 from 200,000 in 1900. Emphasis, he said, should now be shifted from mortality to morbidity as a measure of the prevalence of tuberculosis.

Reporting on a follow-up study of a mass chest X-ray survey in Washington, D. C., Dr. Christie said that only 41 percent of the estimated population was examined, and 35 percent of the cases found were unknown to the health department.

One value of a mass survey, he stated, is that it discloses high-prevalence localities or groups in which screening efforts may be concentrated. The follow-up study showed that one-fourth of those having tuberculosis were age 55 and over although this group was only 10 percent of the population examined. Case finding among the older age group must be intensified, he added.

"Everything," he said, "points to the need for stepping up the program of case finding throughout the Nation and to the need for increased facilities for care of the tuberculous."

Much arduous work remains, Dr. Christie said, but the knowledge accumulated in the Washington survey gives, for the first time, a sound foundation for future planning.

Industrial Employees' Health Programs

Experience obtained in setting up and operating a medical program in the Bureau of Old-Age and Survivors Insurance has shown that the familiar public health techniques can be successfully adapted to industrial medical programs, William T. Doran, Jr., M.D., M.P.H., medical director of the Bureau of Old-Age and Survivors Insurance, Social Security Administration, asserted in his ad-

dress before the section on preventive and industrial medicine and public health.

Before the inception of the program, Dr. Doran said, eight industrial nurses administered on-the-job emergency first aid to employees on the day and night shifts in four separate buildings. Many of the employees had no family physician and did little for their health because of lack of a physician's guidance.

Dr. Doran said that the bureau offered an ideal challenge for the development of such a program because of the nature of its functions, the distribution of its plants, and the character of its personnel.

The specific techniques used in the BOASI program, Dr. Doran said, include participation of employees in planning, surveys of health needs, statistical sampling methods for uncovering health data, sampling to disclose employees' receptiveness to health demonstrations, integration of health activities with those of the local community, health education, follow-up studies, and methods of evaluating the program.

Employee Participation

The important factors in the program outlined by Dr. Doran were team operation, the individual's personal pride in his health, and the "person-doctor" relationship. Emphasis is placed on preventive measures, he stated.

Dr. Doran said methodology is explained to the employee groups and their reaction is sought. Employees' ideas about health and the diseases in which they are interested, health problems of their occupations, their ideas as to methods of obtaining medical and health care and the health services they desire are submitted voluntarily and anonymously by employees, Dr. Doran stated.

A management-labor-medical guidance program, he continued, consists of three advisory committees: one of top management representatives, a second of employees, and the third an ad hoc group of local physicians. These committees afford technical advice and counsel, assist in the dissemination of information, and promote the program.

Available data gathered for initial use early in the program consist of studies of pre-employment examinations and reports of employee visits to health units, hospitals and clinics, and similar sources.

Dr. Doran reported that the first Baltimore service program, a chest survey, reached 99 percent of the BOASI employees. Films, posters, pamphlets, and information articles on health were used. Mental hygiene round-table discussions utilize group dynamics stimulated by a panel of experts from medicine, psychiatry, psychology, social work, personnel, and management.

Recorded data of medical experience, sickness absenteeism, production, and use of health facilities are compiled and tabulated for evaluation of the program or any of its parts.

Each employee has his own unit medical record folder with all data concerning his health experiences, Dr. Doran reported. Punch cards are maintained on the individual's health characteristics to indicate the employee's participation in the projects and lay the groundwork for follow-up study as to the effectiveness of the various programs. Follow-up care of persons found to have tuberculosis, cancer, or other conditions is provided by referral to the individual's private physician, or to city and State facilities, with contact maintained by nurses and social workers from BOASI.

Tabulations of Birth Weight Statistics

A guide for States to follow in gathering prematurity and neonatal mortality data will be found in "Suggested Tabulations of Statistics on Birth Weight and Related Characteristics for Live Birth and Neonatal Deaths." The tabulations are based on data derived from matched birth and infant death certificates and supplement "Recommendations for Developing Comparable Statistics on Prematurely Born Infants and Neonatal Mortality," which was published in 1950.

The original publication and its supplement were issued jointly by: the Public Health Conference on Records and Statistics; the Association of Maternal and Child Health and Crippled Children Directors; and the Children's Bureau and the National Office of Vital Statistics, Public Health Service, Federal Security Agency.